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ABSTRACT

Supplementing a television video tape series for environmental understanding, this manual offers a coordinated series of action and information presentations on the need for environmental change. Designed to present realities of action that man may take anywhere in the world to help preserve the limited resources of this planet, the series has drawn on the thoughts and advice of many concerned ecologists and economic specialists. Numerous aspects of individual, corporate, and governmental impact on the quality of the total environment are examined. Focusing on man as a part of the environment rather than apart from it, the emphasis is on the environmental impact, good and bad, of man's interaction with nature and what the cost is, whether it be pollution, trade-off, or benefit. Thirteen units have been developed to consider these environmental problems, solutions, and evaluations. Each unit begins with a perspective of the problem or situation followed by a summary of the broadcast information. To encourage personal action and involvement, many suggestions are given to answer the question "what can I do?". Completing the unit are sources for further information--books, articles, films, and organizations. (BL)

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MAN BUILDS
MAN DESTROYS

A TELEVISION VIDEO TAPE SERIES FOR
ENVIRONMENTAL UNDERSTANDING

AN ACTION GUIDE
WRITTEN BY
OSBORN SEGERBERG, JR.

THE UNIVERSITY OF THE STATE OF NEW YORK
THE STATE EDUCATION DEPARTMENT
ALBANY, N. Y. 12224

OFFICE OF CULTURAL EDUCATION
BUREAU OF MASS COMMUNICATIONS
STATE SCIENCE SERVICE

SE 014 911

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MAN DESTROYS

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A TELEVISION VIDEO TAPE SERIES FOR
ENVIRONMENTAL UNDERSTANDING

PRODUCED BY
THE NEW YORK STATE EDUCATION DEPARTMENT
AND
UNITED NATIONS TELEVISION

IN COOPERATION WITH
THE ONTARIO EDUCATIONAL COMMUNICATIONS
AUTHORITY,
T.R. IDE, CHAIRMAN

THE UNIVERSITY OF THE STATE OF NEW YORK

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John G. Broughton

Chief, Bureau of Mass Communications
Bernarr Cooper

ACKNOWLEDGMENTS

"Man Builds - Man Destroys" was conceived as a series of action and information presentations on the need for environmental change. Designed to present realities of action that men may take anywhere in the world, to help preserve the limited resources of this planet, the series has drawn on the thought, the well-intentioned advice, and the dedication of many of the world's concerned ecologists.

It would not be possible to give recognition to all those who have dedicated professional thought and personal effort to the series, thus far. As usual in any media effort at the United Nations, Michael Hayward, Chief of Visual Services, is the organizational focus for this massive production effort. For excellent administration of the production of the series, we are indebted to Peter Hollander who was and continues to be the Executive Producer.

The initial content planning and delineation of focused approach was a major contribution from three leading scientists of the New York State Museum and Science Service: D. L. Collins, State entomologist, and chief scientist, Biological Survey; E. M. Reilly, Jr., senior scientist, zoology; and James F. Davis, State geologist, and chief scientist.

To the many experts on environmental need who so willingly appear and lend their thought and effort to enlarging the understanding of all of us, we give special thanks. As is always his custom, William J. Hetzer, associate in Educational Television for the New York State Education Department, has ably seen to much of the finite detail which has made the distribution of this series a possibility.

Bernarr Cooper
Chief
Bureau of Mass Communications

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MAN BUILDS - MAN DESTROYS

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Boris Holtzman
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Preface

The realization of man's total involvement with the biosphere, his love-hate relationship with the natural environment is a concept which, in less than a decade, has experienced a quantum jump from total unawareness and lack of concern to a state of individual nail biting, national debate (sometimes querulous), and restrictive legislation, and now international parleys and agreements. With little or no population control on a worldwide basis, we have learned that what appeared to be isolated instances or localized phenomena of specialized pollution have coalesced into a total degradation of global ecosystems - an accumulation of abuse which must be reversed if we are to survive. The shock of this realization has brought forth a mixed bag of reactions, mostly disorganized and nonconstructive. These range from the wry cynicism of the natural scientists, who saw this situation developing, but whose warnings were ignored so long as they applied to birds or marshes or water tables, to the hysterical frenzy of the environmental demagogue, the purveyor of misinformation and overreaction. Doomsaying is as ineffectual for the total good as was the previous indifference.

Environmental education is the means by which lay citizens can learn the fundamental truths of the Man/Nature interdependence, what has happened to throw this out of balance, and what can rationally be done to cope with the situation - or correct it. It also leads to a greater appreciation of the wonders of the natural system, of which man is only a part. A citizen sophisticated about the environment can weigh and balance, supporting measures which are for the good of his community, his region, his world, and rejecting those which are hasty, ill-considered, or actually counterproductive to the well-being of man in the current life style to which his particular culture and economy have brought him. This leads to the further realization that one nation's freedom of action may work to the environmental detriment of another nation, and that drastic corrective measures taken by one developed nation may be completely unsuitable for a developing nation which has neither the money nor the skilled technology to act other than in its own desperate self-interest. This was the crux of the recent Stockholm Conference on the environment. A worldwide cooperative effort is required - the haves must help the have nots, economically and technologically, on behalf of a viable global existence.

This series of video tapes, "Man Builds - Man Destroys," is a contribution to environmental education. With examples drawn from across the world, filmed on location, and with the cooperation of knowledgeable experts in the complex of environmental and economic specialties, practically every aspect of individual, corporate, and governmental impact on the quality of the total environment is examined. The emphasis is on the environmental impact, good and bad, of man's interaction with nature and what the cost is, whether it be pollution, "trade off," or benefit. This series assumes the viewer to be thoughtful, perceptive, and open minded - a viewer truly receptive to complete environmental education.

In my opinion, this is the most informative and balanced video presentation of environmental problems, solutions, and evaluations which has yet been produced for general use. When viewed with the guidance of Osborn Segerberg's perceptive guidebook, this series makes an outstanding and unbiased contribution to man's understanding of his place and role on this "Blue Planet."

John B. Broughton
Associate Commissioner
for Cultural Education

CONTENTS

Section		Page
Acknowledgments	iii
Preface	v
Introduction	1
1.	IT CAN BE DONE	9
2.	SCARS ON THE SURFACE	27
3.	AMONG THE LIVING	43
4.	POWER TO THE PEOPLE	55
5.	ALL THE FISH IN THE SEA	71
6.	THE CAR IN THE CITY	83
7.	YOU CAN HELP -- THROW IT HERE	95
8.	SIX FATHOMS DEEP	109
9.	FLOW GENTLY	121
10.	STRIKING A BALANCE	139
11.	THE AIR WE BREATHE	157
12.	ONLY ONE EARTH (THE STOCKHOLM CONFERENCE)	171
13.	UNDER NEW MANAGEMENT	187
Guide to Film Distributors	200

INTRODUCTION

Three observers regard an object. One, standing at point A, sees a triangle. A second, from point B, sees a circle. The third, at position C, correctly perceives a cone. The one difference among these observers is perspective.

Even without changing physical position, we have been able to change our perspective by standing on the shoulders of those who have gone before us. At one time, men assumed that the earth was the center of the universe. With this frame of reference astronomers never could explain satisfactorily the movements of all heavenly spheres. When Copernicus offered the correct perspective, the stars and planets took their proper places and men embarked on the long journey that ended with the step of astronaut Neil Armstrong on the moon.

As long as men have walked the earth, they looked at their world to determine their place in the scheme of things, and acted accordingly. MAN BUILDS -- MAN DESTROYS, a coordinated series of television broadcasts, is based upon a new ecological perspective, a new way of looking at things and at ourselves.

Traditionally, we think of the individual as a separate entity, the ultimate unit. Our laws, the way we act are based on that belief. But ecology, the science of relationships, has observed that an individual lives not in isolation, but in context with his environment. He exists within a group of his own kind -- a population. For us, the population could be the people in our town or our fellow countrymen or the entire species, the world population. It is clear enough that even though we may drive our car alone, we must take into account the behavior of fellow motorists, follow instructions of police officers, and rely on the supplies of the gas station attendant. The loner is influenced by words written by his fellow humans while even the dedicated solitary cannot avoid the tax collector.

Individuals interact also with members of other species in what ecologists call a community. We may like to think that we exist separately from all other creatures, but mosquitoes dine on us, microorganisms inhabit us, and we would starve without populations of cows, chickens, cod, corn, apple trees, and on and on. We would use up our oxygen without green plants and the phytoplankton of the sea. A humble bacterium plays a vital role in recycling essential nitrogen. The living community is interrelated with such complexity that we don't even know how many kinds of organisms we may depend upon for survival.

This skein of life coexists with its physical surroundings in a totality known as an ecosystem. On a limited scale, an ecosystem might be a pond, a watershed, or a desert. The largest ecosystem we know -- the whole world -- is the biosphere. The interacting within this ecological system is pervasive and never-ending. If through ignorance or carelessness we cast harmful substances into our surroundings, we later make the uncomfortable discoveries of DDT in our fat, lead in our blood, strontium-90 in our bones, mercury in our tissues, asbestos in our lungs. Indeed, the normal carbon, hydrogen, calcium, phospherous atoms that compose our bodies will return another day to the inanimate part of the continuum. And we see that the Biblical saying of "for dust thou art, and unto dust shalt thou return" is an ecological truth.

It is common to think of physical environments affecting life in a one-way affair -- lush exuberance in the tropics, harsh struggle to survive in the desert. But influences go the other way, too. Man with improvidence has created deserts and, with care, gardens. The interactions persist and permeate like widening circles from pebbles ceaselessly dropped into water. If a section of a city is allowed to deteriorate without repair, eventually it affects all the city's residents. Some seek improvement, some move away, some accept the change. If the seekers of improvement fail, then physical conditions worsen, with further adverse effects upon people. At the end of this cybernetic process are slums and despair. Winston Churchill wisely remarked, "We shape our buildings, and afterwards our buildings shape us," which means the process can go either way.

So our environment is made up of fellow humans, other living things, the physical materials of our air, land, and water. Not only is the individual inextricably bound up with his environment, he is defined by his relations with it. Recognition of the truth of this situation is forcing us to rescind one of our basic viewpoints. It is not man apart, but the opposite: man a part of.

This shift in focus provides a way to judge the proposals of self-proclaimed benefactors of mankind. Since our welfare is intimately related to our environment, the test of any new alteration is: if it's good for the biosphere, it's good for us. If it is harmful for the biosphere, then at some point it will hurt us. While the rule is simply stated, actual cases can be obscure or complicated, as some of the broadcasts demonstrate. We need energy to run our civilization, but environmental damage occurs in securing most of that energy. Should we give up the energy, curtail it, try new methods? Often, we are forced to think about trade-offs, choices between the lesser of two evils or greater of two goods. And always we must strive to divine all the effects of a new policy or program. Only when we are able to assess all the consequences of all our actions will we be able to foresee our future.

This series is rooted in the faith that Homo sapiens -- intelligent man, we have proudly called ourselves -- will act according to his best interests if the course is clearly shown. Not only that we will act, but that we can act -- for we are the crucial actors, the caretakers of all life on earth. The series, then, is an article of optimism that we can manage our destiny, live in harmony with our surroundings and ourselves. It is built on the belief that, just as a long journey begins with a first step, great changes begin with one person: you.

For further information

Books

1. THE CLOSING CIRCLE by Barry Commoner; Knopf, N.Y., 1971, $6.95 or EVERYBODY'S ECOLOGY by Clay Schoenfeld; A. S. Barnes, Cranbury, N.J., 1971, $7.95. The second chapter of Dr. Commoner's book and the first chapter of the latter book are concise summaries of the main points of ecology.
2. WHERE HAVE ALL THE FLOWERS FISHES BIRDS TREES WATER AND AIR GONE? by Osborn Segerberg, Jr.; David McKay, N.Y., 1971, $2.95. A more complete account of ecology for the general reader.
3. FUNDAMENTALS OF ECOLOGY by Eugene Odum; W. B. Saunders, Philadelphia, $11.75. The ecologists' book on ecology.
4. ECOLOGY by Eugene Odum; Holt, Rinehart and Winston, N.Y., 1963, $3.25. A shorter version with somewhat different emphasis.
5. ECOLOGY AND FIELD BIOLOGY by R. L. Smith; Harper & Row, N.Y., 1966, $15 (New edition January 1972). A basic university textbook.
6. THE FOREST AND THE SEA by Marston Bates; Signet, N.Y., 1960, 60¢. One of the best introductions to ecological principles.
7. THE BIOSPHERE, A Scientific American Book; W. H. Freeman, San Francisco, 1970. Incorporating 11 articles on various aspects of the subject. Also in SCIENTIFIC AMERICAN, September 1970.

8. A SAND COUNTY ALMANAC by Aldo Leopold; Oxford, N.Y., $6.50. Wise, eloquent insights into the science of nature.

9. WALDEN by Henry Thoreau. Ecological awareness before the science was defined.

10. THE SUBVERSIVE SCIENCE edited by Paul Shepard and Daniel McKinley; Houghton Mifflin, Boston, 1969, $5.95. Essays toward an ecology of man.

11. SO HUMAN AN ANIMAL by René Dubos; Scribners, N.Y., 1968, $2.45. On man's relation to his environment.

12. ENVIRONMENTAL QUALITY, an annual report on the environmental state of the United States, published by the Council on Environmental Quality in August. The first one appeared in 1970. $2. U.S. Government Printing Office.

Publications

1. SCIENCE
American Association for the Advancement of Science
1515 Massachusetts Ave., NW
Washington, D.C. 20005

2. ENVIRONMENT
Committee for Environmental Information
438 North Skinker Blvd.
St. Louis, Mo. 63130

3. BIOSCIENCE
American Institute of Biological Sciences
3900 Wisconsin Ave., NW
Washington, D.C. 20016

4. SCIENTIFIC AMERICAN
415 Madison Ave.
New York, N.Y. 10017

5. THE CONSERVATIONIST
New York State Department of Environmental Conservation
Albany, N.Y. 12201

6. AUDUBON
National Audubon Society
1130 Fifth Ave.
New York, N.Y. 10028

7. ENVIRONMENTAL SCIENCE & TECHNOLOGY
American Chemical Society
1155 16th St., NW
Washington, D.C. 20036

8. NATURAL HISTORY
The American Museum of Natural History
Central Park West at 79th St.
New York, N.Y. 10024

9. NOT MAN APART
Friends of the Earth
529 Commercial St.
San Francisco, Calif. 94111

10. CF LETTER
The Conservation Foundation
1717 Massachusetts Ave., NW
Washington, D.C. 20036

11. OUR DAILY PLANET
Mayor's Council on the Environment
51 Chambers St.
Room 223
New York, N.Y. 10007

12. Publications also issued by National Wildlife Federation, The Wilderness Society, Sierra Club, Environmental Defense Fund, Natural Resources Defense Council.

Films*

1. THE WORLD AROUND US, 25 min., color, Contemporary Films/McGraw-Hill, $325, rental $18. An introduction to the science of ecology produced by NBC-Smithsonian Institution.
2. WHAT IS ECOLOGY?, 11 min., Encyclopedia Britannica Educational Corporation, color $135, b&w $70. Illustrates interrelationships between plants, animals, and their environment, introducing world's major ecosystems.
3. NO DEPOSIT -- NO RETURN, 10 min., Centron Educational Films, $150, rental $15, grades 4-adult. A poetic interpretation of the condition of the land and the lives of the people who live on it, contrasting many different environments.
4. CAVE ECOLOGY, 15 min., Centron Educational Films, $175, rental $17.50, grades 1-9. The cave community serves as a comparison to larger communities, explaining such basic concepts as food chains, food webs, prey-predator relationships, and adaptation.
5. THE COMMUNITY, 11 min., Encyclopedia Britannica Educational Corporation, color $135, b&w $70. Introduces concept of ecological community, showing interrelationships among a group of plants and animals adapted to the same general physical conditions.

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* Addresses of film distributors are given at the end of this guide.

6. THE LIVING EARTH, 10 min., Pyramid, $120, rental $10, grades 1-adult. Emphasizes interdependence of all living things and wonder of the world.

7. ECOLOGY -- CHECKS AND BALANCES, 14 min., Pyramid, $175, rental $15, grades 4-12. Explores the interrelationships between the ladybird beetle and the aphid to illustrate one of nature's checks and balances.

8. THEY LIVE BY WATER, 26 min., color, University of California, rental $19. The film explores step by step the web of life in a freshwater pond.

9. THE CHAIN OF LIFE, 30 min., color, Indiana University, $315, rental $11.50. Man, as an end-link in the chain, limits his own survival when he destroys other links. Produced by National Educational Television.

10. WHAT ECOLOGISTS DO, 16 min., Centron Educational Films, $210, rental $21, grades 4-12. The film defines ecology and describes what ecologists do.

11. MEN AT BAY, 26 min., King Screen Productions, $350, rental $35, grades 1-adult. Film uses threatened San Francisco Bay to bring out ecological awareness.

12. ENVIRONMENT, 29 min., BFA Educational Media, $370, rental $25, grades 7-adult. A film about degradation of our living environment, raising question of what balance can be achieved between the present level of technology and life-style and a quality environment.

13. THE CHANGING FOREST, 19 min., color, Contemporary Films/McGraw-Hill, $245, rental $15. An essay on the ecology of a deciduous forest.

14. SILENT SPRING OF RACHEL CARSON, 54 min., b&w, Contemporary Films/McGraw-Hill, $275, rental $15. A CBS Reports documentary on the landmark controversy between the pioneering biologist and the chemical pesticides industry.

15. WHAT ARE WE DOING TO OUR WORLD, Parts I and II each are 27 min., color, Contemporary Films/McGraw-Hill, $350, rental $18. An inventory of threats to the environment produced by CBS for the 21st Century.

16. THE ARK, 20 min., Arthur Barr Productions, $250, rental $20, grades 4-college. Presents concept of ecosystem and the effect of pollution.

17. ECOLOGY -- OLYMPIC RAIN FOREST, 20 min., International Film Bureau, $250, rental $12.50, grades 7-adult. Describes significance of the rain forest, illustrating roles of decomposers and scavengers.

18. TREEHOUSE, 9 min., King Screen Productions, $140, rental $15, grades 1-9. Introduces the relationship of man and his culture to his environment and the proper use of natural resources.

19. ECOLOGY PROBE — PLANET EARTH, 10 min., Fordham Publishing Company, rental $45, grades 4-12. Visitors from outer space investigate earth's environment, dismiss planet as unfit for settlement.

Organizations

1. Council on Environmental Quality
722 Jackson Pl., NW
Washington, D.C. 20036

2. Environmental Protection Agency
1626 K St.
Washington, D.C. 20460

3. Conference on the Human Environment
United Nations, N.Y. 10017

4. Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201

5. The Ecological Society of America
Frank McCormick, Secretary
Department of Botany
University of North Carolina
Chapel Hill, N.C. 27514

6. New York State Museum and Science Service
State Education Bldg.
Albany, N.Y. 12224

IT
CAN BE
DONE

9/10

IT CAN BE DONE

Perspective

A myriad of environmental-ecological-resource-population problems burst upon human consciousness in the 1960's. The sudden discoveries of long-lasting radiation poisoning in the atmosphere, long-lived pesticides in the oceans, along with oil, mercury, PCB's (polychlorinated biphenyls), and a host of other chemicals; the land of industrialized countries coated with concrete and autos choking the highways, copper, helium, and other resources becoming short in supply; such newly valued resources as space or quiet began disappearing along with whales and tigers as people and technology permeated the planet.

As signs of the strains of our modern civilization upon natural systems became unmistakable even to the untrained layman, scientists focused powerful instruments of measurement upon these dislocations. In some cases, they documented in precise fashion what at first had been only suspicions. The results of all this attention were alarm, accusations, denials, controversy, impasse, inertia. The second wave of human reaction was heightened concern, redoubled charges provoking recalcitrance, producing dire forecasts, "Silent Spring," DOOMSDAY.

As these attitudes gained acceptance -- as the chorus of foreboding swelled -- it became easy to believe that the problems were overwhelming, out of control, beyond remedy. This attitude leads to hand-wringing and feelings of helplessness, paralysis. A precondition of effective action is faith or confidence: we can act effectively only when we believe we can.

The documentary, IT CAN BE DONE, is a basic theme of the MAN BUILDS -- MAN DESTROYS series. It reflects the already-evident grassroots response to the environmental crisis. It represents the emerging reforms of abuses: mobilization of citizens' groups, growth of environmental law, publication of a sizable body of literature, major attention from newspapers and magazines, new attempts by industry to do things in different ways, stricter municipal, state, and Federal ordinances; realignment of government in order to deal more effectively with environmental problems; the United Nations Stockholm Conference on the Human Environment.

Above all, this theme emphasizes the important role of the individual in meeting this challenge.

The Broadcast: IT CAN BE DONE

The documentary deals with three separate situations -- excessive noise in Manhattan, mercury poisoning at Minamata, Japan, and the practice of spraying DDT in a campaign against gypsy moths in Connecticut.

In New York City, Robert Alex Baron launched a one-man crusade against noise pollution. He gave up a career in the theater to found a group called Citizens for a Quieter City and wrote a book, The Tyranny of Noise. His action was virtually a matter of self-preservation. Jackhammers drilled outside his home in midtown Manhattan every weekday for more than 2 years. Although the noise was mind shattering, there was nothing wrong with it, legally.

Among the points made by Baron and his crusade is that even a citizen in a giant metropolis need not be overwhelmed by environmental problems. He can do something about the stimuli that bombard him. Baron showed that noise -- unwanted sound without message -- can be dealt with in several ways. One is that it is quite possible to make quieter machines... if offended people will demand them. Another is through political and governmental remedy. Baron fought for a "Task Force on Noise" which, in turn, helped establish a city Bureau of Noise Abatement. Then New York City became a municipal pioneer by proposing a Noise Abatement Code to establish a legal apparatus for noise control.

In Minamata, Japan's first chemical fertilizer plant dumped its waste into the nearest body of water, Minamata Bay. Among these wastes was mercury which, in a tragic parody of the Biblical advice of "casting bread upon the waters," came back to the people of Minamata via the biological food chain. The mercury and its compounds was ingested by tiny marine organisms which were eaten by small fish and crustaceans which, in turn, were eaten by larger fish. The tainted fish poisoned at least 180 local people, causing 52 deaths.

Many residents in Minamata felt that the company should indemnify the victims and their families, but the firm disclaimed any responsibility, so the protestors bought single shares of stock in the company and attended a stockholders' meeting, intending to present their case. However, the agenda, enforced by 3,000 special guards, bypassed the issue.

Just when it seemed the protestors had no recourse, their leaders struck upon a novel strategy. They organized a demonstration outside the fertilizer plant by Buddhist monks who chanted hymns and put spiritual curses on the owners of the plant. This kind of publicity was not good for business, and company officials capitulated, agreeing to make restitution to victims of the mercury poisoning and their families.

The third story involves a plague of gypsy moths in the early 1960's. The moths devasted foliage in the normally beautiful woods of western Connecticut. The immediate reaction of the citizenry, and the state, was to fight the insects with the miracle chemical of World War II, DDT. A few residents of Cornwall in the northwestern part of the state, aroused by the message against indiscriminate use of persistent pesticides in Rachel Carson's book, Silent Spring, opposed aerial spraying of DDT, and lost.

But initial defeat provided the means for a much larger victory. These opponents of spraying retained a chemist. Together they conducted an investigation showing how aerial DDT drifted as much as 7 miles from target areas. Even when sprayers aimed only at infected places, the result was widespread contamination, leading to such undesirable "side effects" as the condemnation of poisoned milk.

The final report compiled by the Cornwall group was submitted to the state legislature, with the final result that aerial spraying of DDT was banned in Connecticut in February 1965, an example gradually followed by the Nation.

What can I do?

While the circumstances in each of the three stories appear to be quite different, there is a common theme. In each instance, the initiators formed groups uniting people who desired similar ends. Saul Alinsky, very experienced in shaping effective citizen action, has written: "Change comes from power, and power comes from organization. In order to act, people must get together. Power is the reason for being of organizations."

As we have seen, the status quo is difficult to change. Not only is there inertia, but industries and special interest groups have formed just such organizations -- lobbies and trade groups -- in order that their positions may prevail with lawmakers. A good number of environmental organizations exist; as they gain members their strength increases.

So to begin with, you can give your support to a number of national organizations that have played an important role in defending the environment. Not only would you be helping them, but in most cases your contribution is tax deductible since they are nonprofit groups. More than that, their activities may contribute to your own life and well being.

Herewith are some of these organizations (complete names and addresses are in the next section): the Sierra Club has been in the forefront of the conservation fight; Friends of the Earth, the same; The Wilderness Society, like the Sierra Club offers backpack, horsepack wilderness hikes; the National Audubon Society publishes possibly the most beautifully produced magazine in the United States; (The Conservationist Magazine, published by the New York State Environmental Conservation Department in Albany, is another well produced magazine). The Izaak Walton League and National Wildlife Federation are two other leading conservation organizations, the latter offering still another outstanding magazine.

As of June 1, 1971, the five largest environmental organizations -- National Wildlife Federation, National Audubon Society, Sierra Club, Izaak Walton League of America, and The Wilderness Society -- counted 1.6 million members, an increase of almost 33 percent over the year before. These and other environmental groups -- there are estimated to be some 3,100 of them in the United States -- are beginning to exert political leverage, exemplified by the defeat of the SST program. The Conservation Directory, published by the National Wildlife Federation, lists more than 250 national and regional environmental organizations and nearly 400 State groups.

Natural Resources Defense Council and the Environmental Defense Fund are two environmental legal action organizations, and the Sierra Club also has a legal arm. The Center for Responsive Law, Ralph Nader's group, includes consumer affairs and corporate conduct along with its environmental interests, and emphasizes public investigations as its modus operandi. The Conservation Foundation acts as a philosophic arm of the movement, sponsoring conferences and studies on specific problems; the Nature Conservancy buys endangered land and holds it until it can be turned into park land; World Wildlife Fund works on behalf of endangered animal species; Scientists' Institute for Public Information offers scientific facts about environmental problems (the local New York City group, which sponsors a number of investigative, task force committees, is Scientists' Committee for Public Information); also in New York City, Citizens for a Quieter City fights against noise, and Citizens for Clean Air against air pollution.

Many of these groups can use and would welcome volunteer help.

In addition to national organizations, ad hoc groups have been organized to achieve one particular goal. In mid-1971, it was estimated there were upwards of 2,500 local groups -- in addition to civic, church, school groups, and local chapters of national organizations -- striving to improve the environment of their communities. Perhaps the best known of such groups is Scenic Hudson Preservation Conference, founded in 1963 to prevent Consolidated Edison Company from gutting Storm King Mountain in order to build a pumped storage power plant. Until this time, electric power companies, with approval of the Federal Power Commission or other regulatory agencies, had almost always been able to build new plants wherever they wished. A long, costly legal struggle delayed Con Edison's intended program, forced the FPC to reconsider such siting with a view toward its environmental impact, and set a crucial new legal precedent when a U.S. Court of Appeals ruled that the role of environment must be considered in power plant siting.

In New Jersey, another group of local citizens prevented the Port of New York Authority from building a fourth jetport in one of the metropolitan area's last patches of wilderness, The Great Swamp. Instructed by such examples, groups of citizens in many places have organized to achieve a single objective. If you contemplate a lawsuit, you can get advice and possibly other legal help from Natural Resources Defense Council and/or Environmental Defense Fund.

In addition to being a group member, you can also act as an individual. And whether acting in either capacity, heed these general rules: be informed, keep informed, study in depth the problems you wish to tackle. Effective action is based on complete and correct information. Patience and persistence are required in effecting environmental changes. Good intentions must be backed by tenacity. Know the power structures of your community, state, and Nation. Learn how to maneuver through them (see Publications).

It can be done, it really can. They laughed when Ed Koupal of San Diego gave up his job as a used car salesman to become a citizen activist, but now Koupal heads the California People's Lobby, which is seriously bidding to get the toughest antipollution controls in the country on to the state statute books. In 1963, Greenport, Long Island, harbor was closed to clam digging. It was too polluted; but the clamming was resumed 8 years later, thanks to an antipollution campaign waged equally by local officials, clam diggers, and private citizens. In Montreal, three young residents scrounged through refuse heaps for discarded bottles; then with cutters, tappers, and imagination went into business selling goblets, lamps, jewelry, punch bowl sets, candleholders, turning "waste" into raw material.

In Manhattan, a woman who had been watching from her apartment window reported a company dumping waste concrete into the East River. She precipitated Federal court action under the 1899 Refuse Law (you are entitled and encouraged to report water polluters to your nearest United States attorney under this law; it is explained more fully in the What can I do? section of FLOW GENTLY). The company was found guilty and fined $25,000; the lady was awarded half the fine as her share, as the law prescribes -- $12,500.

There is one other environmental law with which you should be familiar. This is the National Environmental Policy Act (NEPA). This law says that the Federal Government shall try to promote harmony between man and his environment and specifically directs that any proposed legislation or action by any Federal agency must be assessed as to its environmental impact. If there is any significant impact upon environment, then alternative and less harmful approaches must be considered.

Your vote can be one of the effective instruments of environmental reform. Judge candidates on their environmental records or lack of them. The League of Conservation Voters will supply you with a list of how all senators and congressmen voted on key environmental legislation. Question candidates on how they stand on environmental issues. Work for an environmentally aware candidate. Always vote.

Another way elected officials are influenced is by letting them know how you feel about a certain issue. Write to your congressman, your senator, your state and local officials. They do listen if enough people speak.

It also helps to write to the proper person, the correct committee. Your own congressman and two senators are your personal representatives, of course, but certain other lawmakers are by assignment concerned with particular areas of interest. Here are key committees and subgroups in the United States Congress dealing with environmental matters:

Senate: Agriculture and Forestry

Commerce Subcommittee on Energy, Natural Resources, and the Environment

Government Operations Subcommittee on Intergovernmental Relations

Interior and Insular Affairs

Labor and Public Welfare Subcommittee on Health

Public Works Subcommittee on Air and Water Pollution

House: Agriculture

Government Operations Subcommittee on Conservation and Natural Resources

Interior and Insular Affairs

Interstate and Foreign Commerce

Merchant Marine and Fisheries Subcommittee on Fisheries and Wildlife Conservation

Merchant Marine and Fisheries Subcommittee on Oceanography

Public Works Subcommittee on Rivers and Harbors

Public Works Subcommittee on Flood Control

The Joint House-Senate Committee on Atomic Energy

Find out from your current Congressional Directory who are the chairmen and members of these groups. Write to the chairman; perhaps a committee member is one of your representatives. Follow the same procedure for your state legislature and city council.

A third way of influencing lawmakers is through lobbying, this, in effect, is the job of many of the national groups mentioned above. The Environmental Planning Lobby concentrates on New York State legislation.

Finally, you can influence other people for the environmental cause by personal example. Perhaps cleanliness has been placed next to Godliness because it is so difficult to achieve, but we can aspire to it. We can try. It takes application in order to become environmentally aware and in order to evaluate recommended courses of action. It takes understanding to make correct personal decisions and to behave in an environmentally exemplary way.

For further information

Books

1. THE ENVIRONMENTAL HANDBOOK edited by Garrett de Bell; Ballantine/Friends of the Earth, N.Y., 1970, 95¢. Prepared for the first Earth environmental teach-in.
2. YOUR ENVIRONMENT AND WHAT YOU CAN DO ABOUT IT by Richard Saltonstall, Jr.; Walker, N.Y., 1970, $6.95. Title tells it all.
3. IF YOU WANT TO SAVE YOUR ENVIRONMENT...START AT HOME! by Carroll Harrington, et al.; Hawthorn, N.Y., 1970, $2.50. Prepared under the aegis of The Women's League of Voters, this pocket-size book contains lists of do's and don'ts.
4. ECOTATICS by John G. Mitchell and C. S. Stallings; Pocket Books, 1970, 95¢. Under the Sierra Club aegis, what people can do to save the environment.
5. ECOTAGE by Sam Love and David Obst; Pocket Books, 1972, $1.25. Environmental action for activists.
6. EARTHKEEPING by Gordon Harrison; Houghton Mifflin, Boston, 1971, $5.95. A thoughtful explication of the environmental tangle and the indispensable role of the individual in straightening it out.
7. EARTH TOOL KIT, Pocket Books, 1971, $1.25. A field manual for those who want to do something about environmental destruction. SCHOLASTIC TEACHER Magazine says, "Multiple copies are recommended for schools with environmental studies as part of the curriculum."
8. THE LAST WHOLE EARTH CATALOGUE, Portola, 1971, $5. Where to get what tools.
9. USER'S GUIDE TO THE PROTECTION OF THE ENVIRONMENT, Friends of the Earth/Ballantine, 1970, $1.25. A long list of what -- and what not -- to buy to help the environment.

10. OUR ENVIRONMENT CAN BE SAVED by Nelson A. Rockefeller; Doubleday, Garden City, N.Y., 1970, $2.50. A review of New York State programs.

11. DEFENDING THE ENVIRONMENT by Joseph Sax; Knopf, N.Y., 1971, $6.95. By the expert on environmental law on what citizens can do.

12. TEACHING FOR SURVIVAL by Mark Terry; Friends of the Earth/Ballantine, 1971, $1.25. Recommended by SCHOLASTIC TEACHER Magazine.

13. DISASTER BY DEFAULT by Frank Graham, Jr., Curtiss, 1966, 75¢. What happens when citizens don't care or do nothing.

14. THE TYRANNY OF NOISE by Robert Alex Baron; St. Martin's, N.Y., 1970, $7.50. All about noise pollution and what you can do about it.

15. NOISE POLLUTION by Charles Lavaroni and Patrick A. O'Donnell; Addison-Wesley, 1971, $1.68. For students (grades 7-9) with experiments. There's also a teacher's edition.

16. CONGRESSIONAL DIRECTORY, U.S. Government Printing Office, Washington, D.C., paperback $3.

17. THE ENVIRONMENT, THE ESTABLISHMENT AND THE LAW by Henkin, Mertz and Staples; Houghton Mifflin, Boston, 1971, $2. Legal and legislative hearings on environmental problems.

18. CAREER EDUCATION IN THE ENVIRONMENT, A HANDBOOK. U.S. Government Printing Office, Washington, D.C. 20402, $3. Designed for secondary schools to give information on career opportunities.

19. ENVIRONMENTAL -- ECOLOGICAL EDUCATION: A BIBLIOGRAPHY OF FICTION, NONFICTION, AND TEXT BOOKS FOR ELEMENTARY AND SECONDARY SCHOOLS. U.S. Government Printing Office, Washington, D.C. 20402, 40¢.

Magazines

1. SCHOLASTIC TEACHER Junior/Senior High Teacher's Edition, 50 West 44th St., New York, N.Y. 10036, has provided a "Teacher's Survival Guide to Environmental Education Resources" in its October 1971, edition. The guide recommends new teaching materials in multimedia, paperbacks, films, and booklets.

Articles

1. "On the Shores of Lake Michigan, Citizens Fight a Wide Range of Tactics To Protect the Environment" -- CONSERVATION FOUNDATION LETTER, September 1971, The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C. 20036. On citizens' action groups.

2. "The Gypsy Moth" by A. Dexter Hinckley, ENVIRONMENT, March 1972.

3. "Noise in the Environment" by Peter Franken and Daniel Page; ENVIRONMENTAL SCIENCE AND TECHNOLOGY, February 1972.

4. "A Guide To the New York City Noise Control Code," New York City Environmental Protection Administration.

Publications

(See also Publications for introductory section)

1. HELP, a useful list of do's, don'ts, and sources of information in the environmental course. Help, Department of Environmental Conservation, 50 Wolf Rd., Albany, N.Y. 12201.

2. MUNICIPAL ADVISORY COUNCILS FOR ENVIRONMENTAL CONSERVATION, a state guide and bibliography for organizing local environmental action units. New York State Office for Local Government, 155 Washington Ave., Albany, N.Y. 12201

3. COMMUNTIY ACTION FOR ENVIRONMENTAL QUALITY, U.S. Government Printing Office, Washington, D.C. 20402.

4. GETTING SOMETHING DONE issued by The League of Woman Voters Educational Fund, 1730 M St., NW, Washington, D.C. 20036. 15¢.

5. THE CONSERVATION DIRECTORY published annually by the National Wildlife Federation (see Organizations). A complete listing of environmental groups. $1.50.

6. ENVIRONMENTAL EDUCATION 1970, a workbook published by Scientists' Institute for Public Information (see Organizations), listing university courses on ecology and the environment. More courses have been added since 1970 and a personal check of the college of your choice would be worthwhile.

7. TOWARD A QUIETER CITY, A Report of the Mayor's Task Force on Noise Control, New York City, 1970.

8. ENVIRONMENTAL QUALITY, the Annual Report of the Council on Environmental Quality on the state of the Nation. U.S. Government Printing Office, Washington, D.C. 20402.

9. ALL AROUND YOU, AN ENVIRONMENTAL STUDY GUIDE, U.S. Department of Interior, 1971, U.S. Government Printing Office, Washington, D.C. 20402, $1.50.

Films*

1. OUR POISONED WORLD -- WATER, 30 min., Time-Life Films, $350, rental $30, grades 4-adult. For groups studying water pollution, the film emphasizes citizen action growing from indignation.

2. A SEARCH FOR ECOLOGICAL BALANCE, 38 min., Film Images, $360, rental $25, grades 7-adult. With views of ecologist Eugene Odum, film shows how man can alter the environment through carelessness and lack of concern, and presents a list of specific ways people can become involved with environmental conservation.

3. POPULATION AND POLLUTION, 17 min., International Film Bureau, $225, rental $12.50, grades 7-adult. Film studies various pollutions, alternative courses of actions, need for communities to employ ecologists for planning.

4. THE RACE IS LOSING, 30 min., Time-Life Films, $350, rental $30, grades 7-adult. Shows how technology can be changed to aid the environment. Film is useful for groups or classes studying alternative choices for a better environment.

5. OUR POISONED WORLD -- GARBAGE, NOISE, HEAT, 30 min., Time-Life Films, $350, rental $30, grades 7-adult. Presents environmental problems. Film is helpful for groups or classes just beginning to work with environmental conservation.

6. NOISE: THE NEW POLLUTANT, 30 min., b&w, Indiana University, $125, rental $6.75. Film explains how sound is caused and how excessive noise can have harmful physiological and psychological effects.

7. THE NOISE BOOM, 26 min., color, NBC, University of Michigan, Mass Media Ministries. Film reports that two of three cases of deafness are due to noise, gives suggestions about what people can do about lessening noise.

8. SOUND OFF, 10 min., color, Pyramid. A teaching film on the dangers of living in a high-noise environment.

9. NOISE, 10 min., color, Bailey-Film Associates, elementary grades. Explains the difference between sound and noise, explores ways to limit noise.

10. DOWN, DECIBEL, DOWN, 9 min., color, King Screen Productions. A humorous, noisy film about noise pollution on the personal level.

11. MEN AT BAY, 26 min., color, University of Michigan, King Screen Productions. Instructional: a spectrum of people who look at the problem of the deterioration of San Francisco Bay from a variety of viewpoints and interests.

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* Addresses of film distributors are given at the end of this guide.

Organizations

1. League of Conservation Voters
324 C St., SE
Washington, D.C. 20003
The League will send you a record of how all U.S. congressmen and senators voted on key environmental issues for $1.

2. Sierra Club
220 Bush St.
San Francisco, Calif. 94108

3. Friends of the Earth
620 C St., SE
Washington, D.C. 20003

4. National Audubon Society
1130 Fifth Ave.
New York, N.Y. 10028

5. National Wildlife Federation
1412 16th St., NW
Washington, D.C. 20036

6. The Wilderness Society
729 15th St., NW
Washington, D.C. 20005

7. Natural Resources Defense Council
36 West 44th St.
New York, N.Y. 10036

8. Environmental Defense Fund
162 Old Town Rd.
East Setauket, N.Y. 11733

9. The Conservation Foundation
1717 Massachusetts Ave., NW
Washington, D.C. 20036

10. World Wildlife Fund
910 17th St., NW
Washington, D.C. 20006

11. Izaak Walton League of America
1326 Waukegan Rd.
Glenview, Ill. 60025

12. The Nature Conservancy
1800 North Kent Ave., NW
Washington, D.C. 22209

13. Scenic Hudson Preservation Conference
Suite 1625
500 Fifth Ave.
New York, N.Y. 10036

14. Scientists' Institute for Public Information
(also Scientists' Committee for Public Information)
30 East 68th St.
New York, N.Y. 10021

15. Citizens for a Quieter City
345 Park Ave.
New York, N.Y. 10022

Government Agencies

1. Environmental Protection Agency
1626 K St.
Washington, D.C. 20460
Enforces Federal environmental laws.

2. Council on Environmental Quality
722 Jackson Pl., NW
Washington, D.C. 20006
Advises the President. Each August publishes an environmental status report on the Nation, ENVIRONMENTAL QUALITY (see Publications).

3. Environmental Conservation Department
50 Wolf Rd.
Albany, N.Y. 12201
Supervises State environmental and conservation laws.

4. Environmental Protection Administration
Municipal Bldg.
New York, N.Y. 10001
Supervises city environmental matters, including sanitation, sewage, water resources.

5. New York City Bureau of Noise Abatement
51 Astor Pl.
New York, N.Y. 10003

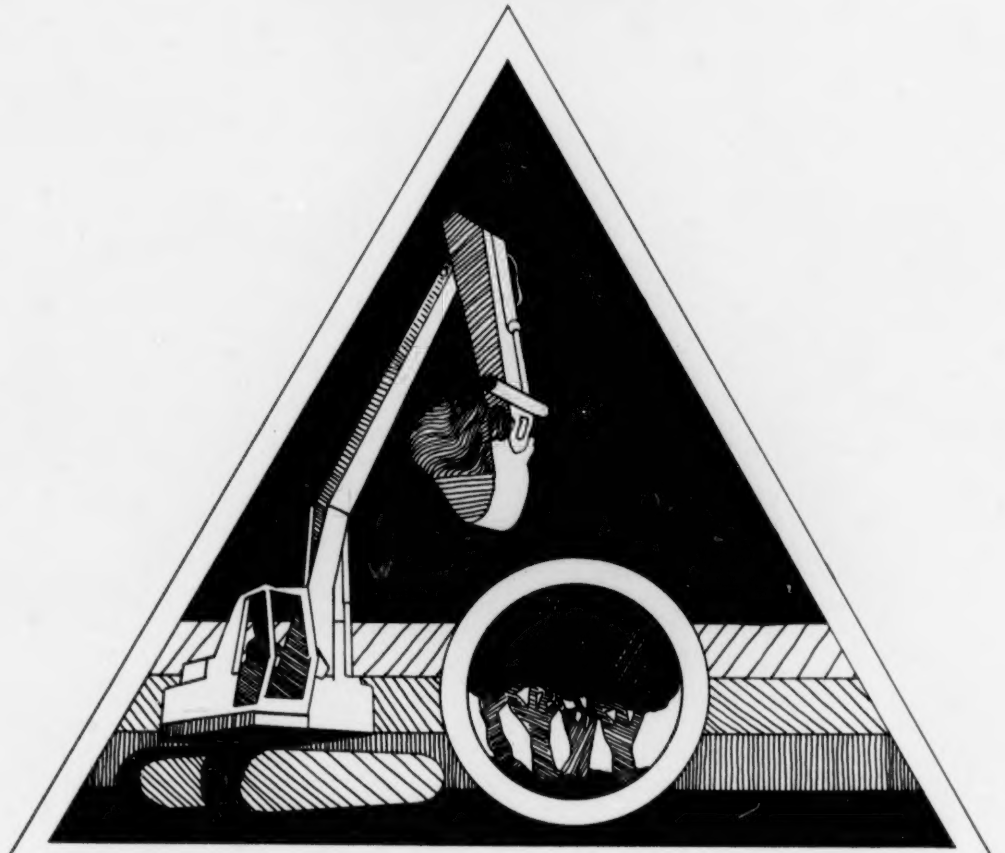
6. Office of Community Assistance
Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201
For information about organizing local groups.

7. See listing of congressional committees in What can I do? section.

8. New York State Museum and Science Service
State Education Bldg.
Albany, N.Y. 12224

25/26

SCARS ON THE SURFACE



27/28

SCARS ON THE SURFACE

Perspective

In the beginning, the ancestors of the human species were an integral part of the natural world, as all other creatures remain today. Anthropologists tell us that Pygmies and other aborigines existing today regard the earth, the forest, the land as their parent.

This attitude was stated eloquently by American Indians to the white men who wanted their land, and sometimes even were willing to pay for it. Said an Indian spokesman at the Council of Drummond Island in 1816:

> The Master of Life has given us land for the support of our men, women and children. He has given us fish, deer, buffalo, and every kind of birds and animals for our use...When the Master of Life, or Great Spirit, put us on this land, it was for the purpose of enjoying the use of the animals and fishes, but certain it was never intended that we should sell it or any part thereof which gives us wood, grass and everything.

A generation earlier, an Iroquois told George Washington:

> The land we live on, our fathers received from God, and they transmitted it to us, for our children, and we cannot part with it...Where is the land on which our children and their children after them are to lie down?

A crucial, and perhaps *the* crucial way by which Homo sapiens freed -- or at least partially freed -- himself from nature's embrace and gained superiority over all other species is through the use and development of "tools." The almost bewildering array of technology today is but the latest stage of this evolution. At first, of course, the "tool" may have simply been a rock which in the hand of an ape-like hominoid conferred a quantum jump in hitting power. With time, proto-humans discovered the virtues of a cutting edge, and over the course of a million years the spearhead evolved into a formidable utensil. And creatures that once survived by picking berries and gnawing roots metamorphosed into the most fearsome hunters of all.

But there had to be a concomitant activity: a never-slackening search for materials to make better weapons, the first quest for a "resource" (a material becomes a resource only after man finds a use for it and assigns a value to it). These early hunters also were miners. Using stone hammers and picks of deerhorn, they scraped their way down to chalk or limestone beds, where the hard flint material for their weapons was to be found.

Jane Jacobs in The Economy of Cities theorizes that the first cities arose in the Middle East because of commerce in a mineral resource, and she selects obsidian, the tough natural glass produced by some volcanoes.

So important were mineral resources to human development that successive ages took their names from the discoveries -- Stone...Bronze... Iron. By this time we are into the story of modern man. In cybernetic interaction, as more mineral resources became available, human needs waxed ever greater...and still newer resources were fed into the process. Coal fueled the Industrial Revolution, petroleum accelerated it, uranium shifted us into the atomic age.

And ever-improved methods of extraction were required -- from the stone hammer and deerhorn pick to "Big Muskie," a strip-mining machine that stands 32 stories high and lifts 325 tons of earth at a scoop. The human appetite for the earth's resources has grown so voracious that an alarming thought is beginning to insinuate itself into the minds of men: the supply is limited.

In an effort to assay the inventory of natural resources, experts have calculated how long known global reserves would last if used at the current rate of consumption. Here are some of the estimates: coal 2,300 years, iron 240 years, aluminum 100 years, petroleum 31 years, natural gas

38 years, copper 36 years, tin 17 years, mercury 13 years. But consumption will not remain static. It will keep growing. Exponential consumption — that is, continual growth with a doubling every few years -- achieves a voracity that is difficult for the unaided human mind to comprehend. With the projected increasing consumption rates for the years ahead, our most abundant nonrenewable resource, coal, would last only 111 years; and even if five times the known reserves of coal are discovered, that expanded supply would last for only a century and a half. Similarly, exponential consumption would reduce the world supply of iron to 93 years, aluminum 31 years, petroleum 20 years, natural gas 22 years, copper 21 years, tin 15 years, mercury 13 years...with only modest extensions even with discoveries of five-fold greater deposits.[1]

[1] These figures are taken from the April 1972 issue of Man Apart publication of Friends of the Earth. Most of the statistics come from U.S. Bureau of Mines Mineral Facts and Problems, 1970, U.S. Government Printing Office, Washington, D.C. Other sources are: U.N. Department of Economic and Social Affairs, Statistical Yearbook 1969, United Nations, N.Y., 1970. Yearbook of the American Bureau of Metal Statistics 1970; Maple Press, York, Pa., 1970. World Petroleum Report, Mona Palmer Publishing, New York, N.Y., 1968. U.N. Economic Commission for Europe, The World Market for Iron Ore; United Nations, N.Y. 1968. Mineral Resources by P. T. Flawn; Rand McNally, Skokie, Ill., 1966. Metal Statistics, American Metal Market Company, Somerset, N.J., 1970. Commodity Data Summary, U.S. Bureau of Mines, U.S. Government Printing Office, Washington, D.C., January 1971.

The number of years known global reserves will last with consumption growing exponentially at the average annual rate of growth is calculated by the formula:

$$\text{exponential index} = \frac{\ln\ ((r\ s) + 1)}{r}$$

where r = average yearly growth rate
s = the number of years known global reserves at current global consumption. Calculated by dividing known reserves by current annual consumption.

Then there is the toll taken of the earth itself: the huge open copper pit in Montana that eats like leprosy toward the city of Butte, the ransacked Cumberland Mountains in impoverished Appalachia, the conversion of fertile Ohio farmland to desolate washboards. In the United States, the devastating method of strip mining is becoming ever more popular and now accounts for about 44 percent of the coal mined.

These wounds, the scars on the surface, reveal civilized man's attitude toward his land. The attitude is 180 degrees removed from the Indians' reverence. Land simply is another possession -- property -- or a means for profit -- units for speculation, spaces for investment in industrialized farming, acreage on which to plant housing subdivisions, or it is regarded as a supply depot.

We have forgotten, says ecologist Eugene Odum, that the land, our earth, also is the oikos, our home (oikos is the Greek word for home, and is the root for "ecology" -- literally, "the study of organisms at home"). Ecology aims to bring man full circle, back into harmony with his environment.

At the root of the environmental crisis is the question: can we go home again?

The Broadcast: SCARS ON THE SURFACE

The broadcast begins with views of earth as seen by Apollo astronauts, an earth that is blue, beautiful, and unscarred. Then we see a montage of mined areas, scars on the planet's surface inflicted by man in his search for minerals and energy: iron from Minnesota, copper from Montana and Turkey, coal from Appalachia, England, and Germany, bauxite from Jamaica. The extractions have been going on for millennia, but now man's needs are growing exponentially. The demands for coal and other energy sources may triple by the year 2000.

Appalachia is a prime source for the coal which fuels American steel mills and electric power plants. West Virginia and Kentucky, surpassing Pennsylvania, Illinois, and Ohio, all yield their quota from the great field of black energy. Much of the extraction is by strip mining. In the steep, winding hills of Appalachia, this means contour mining -- carving out an L-shaped platform along the slope, like a mountain roadway. The soil, rocks, and trees taken out above the seam of coal are dumped down the hillside since there is no other place to put them. After the coal is removed and trucked away, it is virtually impossible to restore the hillside to its original condition. So it has been left that way, although recent laws have required some efforts at reclamation. The results have been an erratic defacing of the Cumberland Mountains, the threats of landslides to the homes of mountain people and, possibly most serious of all, the severe pollution of the streams that are the fountainheads of the great rivers of the area. This pollution is caused by sulfides associated with the coal and the runoff of sediment and nutrients from exposed land.

Harry Caudill, an East Kentucky lawyer who has defended the hill people in their fight against the depredations of strip mining and who wrote an eloquent book on the subject Night Comes to the Cumberlands, vividly describes the plight of his land and its people. Caudill makes a correlation between the impoverishment of the land and the well-known poverty of the people of Appalachia.

In Western Germany, where the surface coal mining is conducted on a more level surface, new techniques of restoration are being used. In a country where land no longer is plentiful, total reclamation is required as a license to mine. So, a huge wheel-like machine strips away the top layers of soil where there is organic life and lays them aside. After the coal is removed, the top strata are replaced. The land can once again be farmed or used for recreation or living communities.

This is a new technology. It is not so easy or simple to effect reforms in countries not already industrialized, where there is no great base of wealth and where the exclusive goals are to develop and achieve prosperity. Turkey is an example. The coal mining at Zonguldak is expanding to meet the needs of a huge new steel plant. The Turks have worked copper and iron in Central Asia since the earliest historical times, but today the demands for such mineral resources are greater than ever.

Turkey is only one of many developing countries. Others in Africa, Asia, and South America are scraping their surfaces for their mineral wealth, but in most cases they will have to export what they mined because they do not have the industrial facilities to transform the ore into finished products of today's civilization. The island of Jamaica in the West Indies is a case in point. Jamaica is the world's leading producer of bauxite, the ore from which aluminum is obtained. Most of this mined bauxite goes directly out of the country because aluminum extraction requires great amounts of electric power, which Jamaica does not have (although one processing plant has been built recently). So, in a sense, Jamaica grows richer by growing smaller.

In the American Southwest, the loss is not only physical, but spiritual. A tremendous new complex of electric power plants is rising at the four corners of the states of Arizona, New Mexico, Colorado, and Utah. In order to provide fuel, miners have begun to strip the coal lode from the Black Mesa, a site long revered as sacred by Hopi and Navajo Indians. Not only is the land being degraded physically, but the Indians feel that the very soul of the land is being destroyed.

Mining is probably as old as man himself and indispensable to his life today, but at some point there will have to come a reconciliation between the demands of man and nature's ability to meet those demands. Some of the environmental impact of mining can be cut down by land rehabilitation requirements and by reducing extravagant and trivial uses of resources.

Ecologist Aldo Leopold suggested that what is needed is a land ethic. Leopold wrote in A Sand County Almanac:

> The first ethics dealt with the relation between individuals; the Mosaic Decalogue is an example. Later accretions dealt with the relation between the individual and society. The Golden Rule tries to integrate the individual to society; democracy to integrate social organization to the individual.
>
> There is as yet no ethic dealing with man's relation to land and to the animals and plants which grow upon it. Land, like Odysseus' slavegirls, is still property. The land-relation is still strictly economic, entailing privileges but not obligations.
>
> The extension of ethics to this third element in human environment is, if I read the evidence correctly, an evolutionary possibility and an ecological necessity.

What can I do?

For openers, reexamine your attitude toward land and your relationship to it. It might help to recall that when Europeans came to America, they were either fleeing the evils of their own human societies and/or seeking the land of opportunity -- opportunity for political liberty and religious freedom, to better themselves, for the good life, success, and riches. They saw the forests as obstacles to be cleared for farmland and later as lumber. They saw the rivers as conduits for transportation and the streams as power to turn mill wheels and all waterways as conveyors to carry away wastes without charge. They saw beavers as raw material for men's hats and nearly exterminated the species. It was only much later that they discovered the wealth underground: gold, silver, coal, oil, uranium.

Few, if any, came to cherish a natural paradise. And rare was the newcomer with the special vision of John Brereton, a Cambridge theologian who landed on Virginia's shore in 1602 and recorded in his diary:

> This island is full of faire trees, of high timbered oaks; Cedars, strait and tall; Beach, Elme, Hollie, Walnut trees in abundance; Strawberries, red and white, as sweet and much bigger than ours in England. Raspberries, Gooseberries, Hurtleberries, and such. Also many springs of excellent sweet water, which is maintained with the springs running exceedingly pleasantly thorow the woodie grounds. This lake is full of small Tortoises, and exceedingly full of divers fowles as Cranes, Hershawes, Bitters, Geese, Mallards, Teales, which breed, some lowe on the banks, and others on lowe trees, about this lake in great abundance, whose young ones of all sorts we tooke and eat at our pleasure. Here are also great stores of Deere, which we saw, and other beasts, as appeared by their tracks. Coming ashore, we stood a while like men ravished at the beautie and delicacie of this sweet soile.

Secondly, try to appreciate, or at least identify, the costs of various benefits. For example, if the cost of electricity were simply the penny or two we pay for a kilowatt hour of electricity, it surely would be the bargain so many industry officials say it is. Unfortunately, that payment is incidental. The real cost is three quarters of a pound of coal per kilowatt hour, the inexorable depletion of a nonrenewable resource. It includes the methodical strip mining of the United States. Already an area the size of Connecticut and Rhode Island has been disturbed. There's sulfur dioxide in the air, depletion of oil, spills into rivers and oceans during the transportation of oil, thermal pollution, subsidence of land from deep mining, acid pollution from abandoned deep mines and sediment pollution from strip mines of tens of thousands of miles of streams, an end to most of America's wild rivers which have been damed to provide hydroelectric power, visual and esthetic pollution from aboveground power lines.

Try this kind of cost accounting for other commodities.

Thirdly, try fitting yourself more economically into your world. Cut down dependence on electrical and other sources of energy (See What can I do? sections of THE CAR IN THE CITY, SIX FATHOMS DEEP, THE AIR WE BREATHE). Reject frivolities or any nonessential purchases that contribute to resource depletion. If everyone kept his present automobile one year extra, the saving in steel would be enormous. Question some of today's merchandising practices. Doesn't it seem a wanton extravagance to enclose 12 ounces of soda pop within all that nonrenewable steel or aluminum? It might be more justifiable if the metal were recycled.

Fourthly, support, take part in all forms of recycling and reuse (See What can I do? section of YOU CAN HELP -- THROW IT HERE).

Fifthly, learn about land rehabilitation legislation in your state and support those efforts which are well thought through.

Write to your congressman and other representatives about the above matters. Support candidates, lawmakers, officials who have an ecological outlook.

Finally, in making these suggestions or recommendations, it should be remembered that these acts in themselves will have repercussions. And reactions to them will have to be thought through. Just as one example -- if everyone kept his automobile an extra year, there would be an enormous saving in steel, but there could be an incalculable impact upon the economy. There could be such a downturn in the auto industry that many jobs would be lost or furloughed. With foresight, this lost business might be compensated for in other ways -- increased auto service, using recycled metals to build mass transit vehicles, the planned encouragement of other industries. Obviously, it wouldn't be easy. At the same time, we want to extricate our society from the position of making things that are no longer needed or are environmentally harmful simply to keep the economy turning. This latter situation would mean that we have lost control of our technology and it is operating independently from human needs or wishes like a sorcerer's apprentice.

For a further discussion of the complex interactions among people, resources, and environment, see the What can I do? section of ALL THE FISH IN THE SEA.

For further information

Books

1. NIGHT COMES TO THE CUMBERLANDS by Harry Caudill; Little, Brown and Company, Boston, 1962, $2.45. The classic on what has happened to Appalachia.

2. MY LAND IS DYING by Harry Caudill; E. P. Dutton, N.Y., 1972, $6.50. Bringing the book above up to date.

3. THE QUIET CRISIS by Stewart Udall; Avon, N.Y., 1964, 95¢. See the first chapter "The Land Wisdom of the Indians" and the last "Notes on a Land Ethic for Tomorrow."

4. A SAND COUNTY ALMANAC by Aldo Leopold; Oxford, N.Y., 1949, 1966, $6.50. See "The Land Ethic."

Publications

1. MINERAL FACTS AND PROBLEMS, 1970, U.S. Bureau of Mines, U.S. Government Printing Office, Washington, D.C.

2. ELECTRIC POWER AND THE ENVIRONMENT, A Report Sponsored by The Energy Policy Staff, Office of Science and Technology, August 1970. U.S. Government Printing Office. Advocates counting in the environmental costs and employing a unified energy policy.

3. BITUMINOUS COAL FACTS, an annual report filled with statistics by the National Coal Association (see Organizations).

4. SURFACE MINING AND OUR ENVIRONMENT, a special report to the Nation by the U.S. Department of the Interior. The definitive study of surface mining in the United States to the mid-1960's. U.S. Government Printing Office. $2.

5. EFFECTS OF SURFACE MINING ON THE FISH AND WILDLIFE RESOURCES OF THE UNITED STATES, Department of the Interior, Fish and Wildlife Service, Resource Publication 68, 1968, U.S. Government Printing Office. 60¢.

6. STUDY OF STRIP AND SURFACE MINING IN APPALACHIA, Department of the Interior, 1966. U.S. Government Printing Office. $1.

Articles

1. Review of "The Limits to Growth" by Hugh Nash in NOT MAN APART (a publication of Friends of the Earth, 529 Commercial St., San Francisco), April 1972. This review contains a list of 19 nonrenewable natural resources, their known global reserves, how many years it would take to consume them at current rates, and other statistics based mainly on MINERAL FACTS AND PROBLEMS, 1970, published by the U.S. Bureau of Mines.

2. "The Human Revolution" by Charles F. Hockett and Robert Ascher; CURRENT ANTHROPOLOGY, 5 (3):135-168, 1964. Also anthologized in THE SUBVERSIVE SCIENCE edited by Paul Shepard and Daniel McKinley, Houghton Mifflin, Boston, 1969. The article summarizes biological and social evolutionary changes.

3. "The Human Species." The September 1960 issue of SCIENTIFIC AMERICAN is devoted to the evolution of man with nine separate articles.

4. "The Historical Roots of Our Ecological Crisis" by Lynn White, Jr.,; SCIENCE, 155: 1203-1207, 1967. Also anthologized in THE SUBVERSIVE SCIENCE.

5. "Power Corrupts" by Osborn Segerberg, Jr.; ESQUIRE, March 1972. On the relationship of the Tennessee Valley Authority to strip mining.

6. "As More and More Coal is Stripped from the Land, the States Are Hard Put to Exercise Effective Control" -- CF LETTER, January 1972; The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C. 20036.

7. "Appalachia -- Like the Flayed Back of a Man" by James Branscome; NEW YORK TIMES MAGAZINE, Dec. 12, 1971.

8. "Coal Rush Is On as Strip Mining Spreads Into West" by Ben A. Franklin; THE NEW YORK TIMES, Aug. 22, 1971.

9. "Taming the Strip-Mine Monster" by Edmund Faltermayer; LIFE magazine, Oct. 1, 1971.

10. "Strip-Mining Boom Leaves Wasteland in Its Wake" by Ben A. Franklin; THE NEW YORK TIMES, Dec. 15, 1970. On strip mining in Ohio.

11. "Paradise Is Stripped" by Harry M. Caudill; NEW YORK TIMES MAGAZINE, March 13, 1966. On the TVA steam plant and surrounding mines at Paradise, Ky.

12. "The Lonely War of a Good Angry Man" by David McCullough; AMERICAN HERITAGE, December 1969. About Harry Caudill and strip mining.

13. "The Price of Strip Mining" -- TIME Magazine, March 22, 1971.

14. "The Economics of Environmental Quality" by Sanford Rose; FORTUNE Magazine, February 1970. On the business of "externalities" or costs that businesses never pay.

Films*

1. BEFORE THE MOUNTAIN WAS MOVED, 58 min., color, Contemporary Films/McGraw-Hill, $595; rental, one classroom showing, $50. Examines the dilemma faced by residents of the Appalachian mountains due to indiscriminate and careless mining practices.

2. RAVAGED LAND, 15 min., color, University of California, rental $15. Explores environmental damage in Appalachia caused by strip mining, recommends reforms based on mining practices in England and central Europe.

3. OUR VANISHING WILDERNESS Series: THE WATER SO CLEAR A BLIND MAN COULD SEE, 30 min., color, Indiana University, $315, rental $11.50, grades 7-12. On the harmony of New Mexico's Taos Indians with the land. Produced by National Educational Television.

4. ALTERED ENVIRONMENTS: AN INQUIRY INTO THE AMERICAN WILDLANDS, 10 min., BFA Educational media, $135, rental $8, grades 1-9. A basic theme is man's exploitation of America's wildlands and their natural resources.

5. THE COMING OF MAN, 13 min., color, Contemporary Films/McGraw-Hill, $175, rental $12.50. Evolution of primates from the development of the opposable thumb to farming, exploring ape-man, stone age man, Neanderthal man and Cro-Magnon man.

Organizations

1. U.S. Bureau of Mines
Department of the Interior
Washington, D.C. 20240

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* Addresses of film distributors are given at the end of this guide.

2. Department of the Interior
Washington, D.C. 20240

3. National Coal Association
Coal Bldg.
Washington, D.C. 20036

4. Federal Power Commission
441 G St.
Washington, D.C. 20426

5. American Petroleum Institute
1801 K St., NW
Washington, D.C. 20006

6. United Mine Workers Union
900 15th St.
Washington, D.C. 20005

7. Natural Resources Defense Council
36 West 44th St.
New York, N.Y. 10036
Has developed an extensive file on surface mining.

41 /42

AMONG THE LIVING

43/44

AMONG THE LIVING

Perspective

In many respects, and as far as we can tell, we are the most successful species that ever existed on earth. Nature acknowledges success with a standard reward. It allows more members of that species to survive. More are born. The population grows. But there is a limit. There is always a limit. In nature, a population usually will surpass the limit, then adjust -- that is, contract -- until it meets the particular ecosystem's carrying capacity. When we look around us, we see that populations of all species are regulated. When a population has used all the available food, space, sunlight, resources or as much of these as possible in competition with other species -- then that population stops growing and settles into an equilibrium with its environment. If the population exceeds the environment's carrying capacity by a great amount, as in the case of some insects, or if the environment suddenly changes, when a food source is removed by harvest, for instance, there is a "crash" -- a mass die-off.

We have been so successful in providing food for ourselves, in defeating our enemies, in manipulating the environment to our advantage that human growth is an extraordinary event. Bacteria, for example, can double every 20 minutes and with sufficient food and space could grow in 36 hours to cover the entire planet. One hour after that, if the growth kept on, the bacteria would be over our heads. In contrast to the bacteria, whose doubling rate is constant, the human population doubling time has been growing shorter all through history. From the dawn of agriculture about 10,000 years ago to the time of Christ, the human population grew from about 5 million to some 130 million. The average doubling rate for that period was 1,800 years. Today, the doubling time is 35 years (while the base has grown to more than 3.6 billion individuals).

A learned committee on resources and man of the National Academy of Sciences has concluded that possibly the earth could support a maximum of 30 billion people -- but under miserable living conditions and near starvation for most. This fantastic sum is only three doublings -- about a century -- away. The multidisciplinary committee concludes that "a human population less than the present one would offer the best hope for comfortable living for our descendants, long duration for the species, and the preservation of environmental quality."

It has been popular to assign overpopulation to poor, underdeveloped countries, but today scientists are learning to broaden their thinking. For instance, one American uses 35 times as much energy as a citizen of India, 100 times as much as the pre-Columbian inhabitants of the United States. The complex, highly industrialized American civilization -- with 6 percent of the world's population -- requires perhaps 40 percent of the world's resources in order to maintain itself. In terms of carrying capacity, is this overpopulation? In terms of survival, who is more vulnerable -- the Indian whose needs are modest or the American whose requirements are vast?

The Broadcast: AMONG THE LIVING

AMONG THE LIVING relates population growth directly to contemporary life, focusing on the Long Island town of Huntington where population has doubled twice during the past two decades. With only 25 percent of its 100 square miles still undeveloped and vacant land disappearing, Huntington is trying to work out a novel ecological land use program that would in effect begin to curtail and eventually stabilize its population.

Such an attempt aggravates already bruised conditions in our society -- fears that the policy is exclusionist, with race and wealth the de facto standards. On the other hand, to follow a laissez faire policy will mean that historically attractive Huntington will join other crowded areas in Nassau and Suffolk counties where the entire population may soon be too large for the local water supply.

The dilemma leads to a larger discussion of just what is an optimum population size for any particular area (including the entire world). This question of an "optimum" population is a surprisingly belated one to come to the attention of science and is just beginning to be investigated and debated. So tangled and complicated are the issues that there is a variety of opinions.

Population biologist Paul Ehrlich, who believes we are overpopulated worldwide and U.S.-wide, says an optimum population for the United States would be somewhere between 50 and 100 million people, and he estimates that if all the people on the globe were to exist at the U.S. standard of living, then the planet could support a world population of only 500 million, one seventh its present size. Another ecologist, microbiologist Barry Commoner, believes that present environmental deterioration is due not so much to population growth as to the misuse of technology. Social scientist Philip Hauser, aware that inventive man has managed to expand the food supply constantly and has added impressively to his list of resources even while depleting natural supplies, decries what he sees as alarmist attitudes toward population growth.

There is one common ground for all the experts, no matter how divergent their views. Since the planet and its resources are finite, they agree that human population growth must come to an end, and will. The real questions are when and how.

What can I do?

You can examine your attitudes. Do you believe that an old maid, a spinster, a "bachelor girl" is a failure in life? Do you feel that if a man does not marry, he must be a social misfit? A great many Americans do hold these attitudes although there was a time not so long ago when the maiden aunt was a valued member of the family, a staple of society, and the bachelor the center of attention. One result of the present social pressure is a near universal conformity -- most Americans marry.

Not only do most Americans marry, but traditionally they marry young. Thomas Malthus remarked on this penchant back in 1798 when he wrote his famous essay on population: "In the United States of America, where the means of subsistence have been more ample, the manners of the people more pure, and consequently checks to early marriage fewer than in any of the modern states of Europe, the population has been found to double itself in twenty five years."

To cite an example of what delay in giving birth can mean to population growth, zoologists compare two elephant refuges in Africa. In one, where the density is relatively low, the young are weaned at age 8, the female gives birth to her first offspring at 12, then reproduces once every 7 years. In the high density area, because the foliage has been stripped high up on the trees the young elephants nurse until age 10. The female does not begin reproducing until she is 20 years old and then breeds every 12 years. This delay and spacing of offspring cuts reproduction in half and reduces population growth by two-thirds.

To put it in human terms, let us suppose a woman born in 1900 reproduces at maximum capacity. She has one daughter a year from the time she is 15 until she is 45 years old — 30 daughters. Each daughter also reproduces at the maximum rate. By 1950, that family numbers 317 offspring. If the original woman had delayed just 2 years -- did not have the first two daughters -- then the family would be smaller by one quarter. In Ireland and some other European countries where populations are nearly stabilized, late marriages are common. (An extensive survey conducted among 28,000 American families showed that 28 percent of the men who married before the age of 22 were divorced compared to only 13 percent of those married after 22. Among women, 27 percent of those who entered into teenage marriages were divorced compared with only 14 percent of those who married in their 20's. Having children during the first 2 years of marriage doubles the probability of divorce.)

Starting in the 1960's and then accelerating in 1971 the United States birth rate has declined; by the first quarter of 1972 it probably had reached an unprecedented low of a zero growth rate...meaning that the national population would no longer increase if that rate were maintained for 70 years. Until this decline, which could reverse itself just as quickly, the population of the United States had been increasing at a rate of one percent a year. This doesn't sound like much, but it means that 70 years from now there will be twice as many Americans as there are today if the rate continues. If you believe that extra large families, particularly in minority groups are mainly responsible for this increase, you would be wrong. The reason for the growth is that so many average American parents decide to have three or four children. If the two-child family became the ideal, then social pressure would work for population balance.

Back to attitudes. Do you believe there is something "wrong" with the childless couple? Do you think a man and wife can have as many children as they want, no matter what the number, as an absolute right without any other considerations? Do you believe that a woman really has only one role in life -- to be a mother and housewife?

The childless man and wife should be objects of civic gratitude, for they are paying more than their fair share in school and other taxes which educate and care for other people's children. As for everyone having as many children as he or she wants, President Nixon has said in a message to Congress, entitled "Problems of Population Growth": "Perhaps the most dangerous element in the present situation is the fact that so few people are examining these questions from the viewpoint of the whole society." (People can have large families through adoption without adding to the population.) As for the third question, social scientists say many women become full-time, lifelong housewives through default (hardly the best way to become anything) because they have not been educated, trained, or encouraged to make any other contribution to society.

Finally, ask and then find your answer to these questions. Is it immoral to bring an unwanted child into this increasingly crowded, competitive world? Is a philosophy of perpetual growth -- whether economic, industrial, physical -- realistic? If our goal has changed to stabilizing population, shouldn't income tax exemptions be eliminated after the second child?

Your attitude affects others. You would be surprised how influential you can be by passing along your conclusions to your congressman, senators, and state representatives.

For further information

Books

1. RESOURCES AND MAN, National Academy of Sciences/National Research Council; W. H. Freeman, San Francisco, $2.95. The most authoritative study to date on the resource-population equation.

2. EFFECTS OF POPULATION GROWTH ON NATURAL RESOURCES AND THE ENVIRONMENT, hearings before a Subcommittee of the House Committee on Government Operations, 91st Congress; U.S. Government Printing Office, Washington, D.C., $1. Excellent discussion with diverse points of view.

3. THE POPULATION BOMB by Paul R. Ehrlich; Ballantine Books, N.Y., 95¢. A simple, polemical approach to the population problem; the book that made Dr. Ehrlich famous.

4. POPULATION, RESOURCES, ENVIRONMENT by Paul R. and Anne H. Ehrlich; W. H. Freeman, San Francisco, $8.95. An erudite, statistics-filled, bibliographed volume and an explanation indicating why Dr. Ehrlich enjoys a high reputation among scientists.

5. THE LIMITS TO GROWTH by Dennis L. Meadows, et al., Potomac Associates, Washington, D.C., $2.75. The highly-publicized Club of Rome report on computer studies of various kinds of growth on the world scale.

6. POPULATION, EVOLUTION, AND BIRTH CONTROL by Garrett Hardin; W. H. Freeman, San Francisco, $2.95. A collection of pertinent material on the subject, including excerpts from Malthus' essay as well as Hardin's "The Tragedy of the Commons."

7. THE FINAL REPORT OF THE U.S. COMMISSION ON POPULATION GROWTH AND THE AMERICAN FUTURE, U.S. Government Printing Office; also a paperback edition published by New American Library, 1301 Avenue of the Americas, New York, N.Y. 10019.

8. ARE OUR DESCENDANTS DOOMED? edited by Harrison Brown and Edward Hutchins; Viking, N.Y., 1972, $3.45.

9. THE CLOSING CIRCLE by Barry Commoner; Knopf, N.Y., $6.95. A look at the equation with emphasis on technological aspects.

10. TOO MANY AMERICANS by Lincoln Day and Alice Taylor Day; Dell Publishing Co., N.Y., $1.95. The viewpoints of social scientists. Mr. Day is chief of the United Nations demographic section.

11. ABORTION: LAW, CHOICE AND MORALITY by Daniel Callahan; Macmillan, N.Y., 1970, $14.95. A survey.

12. THE AMERICAN POPULATION DEBATE edited by Daniel Callahan; Doubleday, Garden City, N.Y., 1971, $2.50.

13. A SOURCEBOOK ON POPULATION; 1969, 50¢. Surveys the whole population field, available from Population Reference Bureau (see Organizations).

14. SCIENCE FOR SOCIETY -- A BIBLIOGRAPHY by John Moore; 1971, $1. More than 4,000 recent books and articles. Available from the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005.

15. An extensive bibliography may be obtained from Planned Parenthood/World Population, 810 Seventh Ave., New York, N.Y. 10019. The organization maintains a library devoted to population and related subjects.

Articles

1. "Population: the U.S. Problem, the World Crisis," supplement, THE NEW YORK TIMES, April 30, 1972, Section 12. Also contains brief bibliography.

2. "Problems of Population Growth" by Richard M. Nixon, the President's message to Congress on the population question, July 18, 1969. U.S. Government Printing Office.

3. "The Human Population" by Edward S. Deevey, Jr., SCIENTIFIC AMERICAN, September 1960.

4. "Resources, Population, and Quality of Life" by Preston Cloud; Meeting of the American Association for the Advancement of Science, Boston, December 1969.

5. "Effects of Population Growth on Natural Resources and the Environment," hearings before a Subcommittee of the Committee on Government Operations, House of Representatives, September 15-16, 1969. U.S. Government Printing Office.

6. "Toward a Non-Malthusian Population Policy" by Jean Mayer, COLUMBIA FORUM, Summer 1969.

7. "An Essay on the Principle of Population" by Thomas Malthus, 1798.

Films*

1. THE TIME OF MAN, 50 min., color and b&w, Holt, Rinehart & Winston, rental $40. Superbly filmed record of man's evolving relationship with his environment.

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* Addresses of film distributors are given at the end of this guide.

2. POPULATION ECOLOGY, 19 min., color, Encyclopedia Britannica Educational Corporation, rental $12.50. Exposition of growth and regulation of natural populations with consideration of anomalous factors in the human situation.

3. BANQUET OF LIFE, 55 min., S.U.N.Y. College of Forestry. Discusses the population spiral and finite resources of earth.

4. NO ROOM FOR WILDERNESS, 30 min., color, Association Films, rental $5.

5. THE EARTH AND MANKIND -- six films, 28 min. each, b&w, Contemporary Films/ McGraw-Hill, rental $14 each. Produced by the National Film Board of Canada, the films are about population and food supply. They are "People by the Billions," "Man and His Resources," "To Each a Rightful Share," "The Global Struggle for Food," "Can the Earth Provide," "Challenge to Mankind."

6. THE POPULATION PROBLEM -- six films, 30 min. each, color or b&w, University of Indiana, rental $10 each. Produced by National Educational Television, the films are "Brazil: The Gathering Millions," "The European Experience," "Japan: Answer in the Orient," "India: Writing in the Sand," "USA: Trouble in Paradise" (40 Min.), "New Facts of Life."

7. THE PROBLEM IS LIFE, 29 min., color, Contemporary Films/McGraw-Hill, rental $11. Portrays the birth control program in India.

8. A SINGLE STEP, 28 min., color, Planned Parenthood/World Population, rental $12.50. Shows the connection between population stress and environment.

9. STANDING ROOM ONLY, 25 min., color, Contemporary Films/ McGraw-Hill, $325, rental $18. Film examines the proposition that the world can support an ever-rising population. Produced by CBS for the 21st Century.

10. POPULATION EXPLOSION, 15 min., color, Contemporary Films/McGraw-Hill, $200, rental $12.50. A National Film Board of Canada production.

11. Planned Parenthood/World Population, 810 Seventh Ave., New York, N.Y. 10019. Will provide a guide free of charge to a variety of films on the subject.

Filmstrips

1. THE PEOPLE PROBLEM. Two parts, 14 min. each. Color filmstrip and two records; includes interviews with Dr. Alan Guttmacher of Planned Parenthood and Dr. Bernard Berelson of The Population Council. Price: $35 from Guidance Associates, Pleasantville, N.Y.

Organizations

1. Planned Parenthood/World Population, 810 Seventh Ave., New York, N.Y. 10019. (affiliates, 190 of them, through the United States) For comprehensive advice on family planning, contraceptive methods, and so forth.

2. Family Planning Information Service, 300 Park Ave. South, New York, N.Y. 10010; (212) 677-3040. For information about abortion.

3. United Nations
   Population Division -- for information on birth control programs.
   U.N. Fund for Population Activities, United Nations Development Programme -- raises money for fertility control.
   Demographic section -- world population statistics.
   United Nations Plaza, New York, N.Y. 10017

4. Population Council
   245 Park Ave.
   New York, N.Y. 10017
   A nonprofit organization specializing in scholarly presentations on population developments.

5. Population Reference Bureau
   1755 Massachusetts Ave., NW
   Washington, D.C. 20036
   A nonprofit organization which publishes population statistics and various scientific studies.

6. Bureau of the Census
   Department of Commerce
   Suitland, Md. 20233
   For vital U.S. statistics on population.

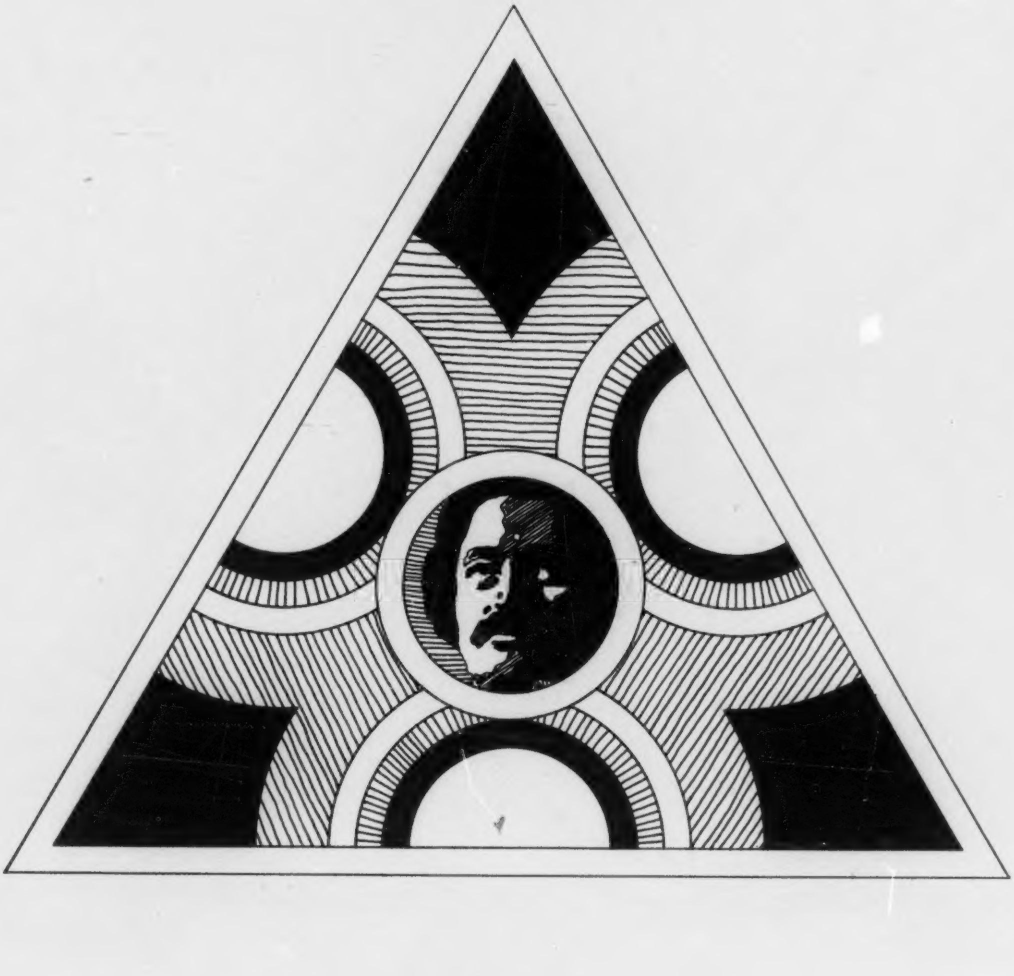
7. Office of Information
   National Center for Health Statistics
   Health Services and Mental Health Administration
   Rockville, Md. 20852
   For vital statistics on births, deaths, diseases, actuarial tables, etc.

8. Zero Population Growth
   4080 Fabian Way
   Palo Alto, Calif. 94303
   A nonprofit organization lobbying for population stabilization with 300 local chapters.

Conferences

1. The United Nations will hold a conference on population, scheduled for 1974.

POWER
TO THE
PEOPLE



55/56

POWER TO THE PEOPLE

Perspective

Energy is the fuel of life. The 2,000 or more calories of energy you take into your body each day in proteins, carbohydrates, and fats sustain your life. If you do not eat enough food to meet minimum requirements, you begin to lose weight; if the process continues long enough, you become emaciated and finally die.

This biological energy comes from other (once) living things -- plants and animals. The ecological food chain is simply the network by which energy passes through the living community. The whole structure is based on the device nature effected billions of years ago to capture and utilize solar energy -- photosynthesis. Through photosynthesis, plants manufacture enough material for themselves and have enough left over to feed grazing and browsing animals -- the herbivores. Energy is lost in the transfer, but still enough remains so that other animals can kill and live off herbivores. We know these carnivores as predators. With an energy loss at each level of transfer, what we see is a pyramid of life. Man takes an ever increasing helping from this natural repast, and his extra-biological energy budget is growing even faster.

In the beginning, 10, 20 million years ago, our ape-like hominoid ancestors competed with the creatures of other species for the contemporary solar energy with little or no particular advantage. These hominoids gathered berries and nuts, ate roots and carrion when they could. It was not until perhaps 2 million years ago with the discovery of tools (weapons) that hominoids (as later stages of ape-men were called) gained an advantage. They became predators, carnivores, and as meat-eaters, bands of them could extend their range. They were no longer limited to perennially fair weather areas.

Actually, this meant that the protohuman species could avail itself of newer and greater sources of biological energy, but such an advantage leads to further exploitation. "Between this earliest stage and the dawn of recorded history," writes M. King Hubbert, "this species distinguished itself from all others in its inventiveness of means for the conquest of a larger and larger fraction of the available energy. The invention of clothing, the use of weapons, the control of fire, the domestication of animals and plants, all had this in common: each increased the fraction of solar energy available for use by the human species, thereby upsetting the ecologic balance in favor of an increased population of the human species, forcing adjustments of all other populations of the complex of which the human species was a member."[1]

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[1] This statement is from Resources and Man (see Books).
The Atomic Energy Information Service gives the following energy-source timetable:

Fire	360,000 BC	(other sources say 500,000 BC)
Domestic animals	6000 BC	(8000 BC?)
Wind (sailing)	3500 BC	
Charcoal (smelting metal)	3000 BC	
Water power (milling, pumping)	1000 BC	
Whale oil (light)	900 AD	
Coal	1300	
Coke (smelting steel)	1753	
Electric battery (telegraph)	1844	
Petroleum	1857	
Steam electric power	1882	
Hydroelectric power	1886	
Gasoline (horseless carriage)	1886	
Central station electric power	1896	
Widespread electrical power	1926	
Nuclear power	1945	
Nuclear electric power	1957	

Human beings kept enhancing their energy supply by chopping down forests to supply heat, tapping water and wind for power, using beasts of burden, and increasing farmlands. All of these sources of energy are directly related to the sun. "Emancipation from this dependence on contemporary solar energy was not possible until some other and hitherto unknown source of energy should become available."

This occurred in Western Europe during the 12th or 13th centuries with the discovery of coal. This also was solar energy, to be sure, but energy that had been locked away for hundreds of millions of years. The importance of coal did not become fully realized until 200 years ago when James Watt invented the steam engine; then the chemical energy from coal could be converted to physical work. Another energy revolution occurred during the past century or so with the discovery of another fossil fuel source -- oil -- and its power converter, the internal combustion engine.

Today, the average American still uses 2,000 calories or so of food energy as did his prehistoric forebears; but today that intake comprises only 1 percent of the average American's energy budget. The other 99 percent powers his generators, automobiles, airplanes, factories, communications networks. Civilized man has grown to be almost as dependent on this total energy budget as were his predecessors on their modest allotment. In fact, modern man's energy needs are doubling every 10 years, and he must continually seek new sources.

It is in this context that the peaceful use of nuclear power appears in our history. Again, a totally new source, hitherto unexpected before the turn of this century and the Einsteinian equation. It is the first source of power not derived from solar energy. As a fuel, it could be virtually unlimited.

Yet there are drawbacks, as we learn from the broadcast, which explores contemporary energy sources.

The Broadcast: POWER TO THE PEOPLE

The broadcast begins by suggesting how enormous has become our appetite for energy -- in the next 30 years we will use as much power as all the humans who ever lived, and this despite the fact that two-thirds of the world's population has no electricity. This demand for energy is doubling every 10 years.

Then two questions are posed. One is physical, technological. Can this demand be met? The other requires a value judgment. Should it be met?

The Northeast power blackout of November 9, 1965, was a chilling... and amusing...brief look at what happens to a highly industrialized civilization when the electric power is snapped off. It is a demonstration in reverse of how dependent on external forms of energy we have become.

Geologist M. King Hubbert takes us back through time to tell how things began: the oldest living entity, a microorganism, 3.2 billion years ago...oil deposits dating back 600 million years...coal formed in the carboniferous age 300 million years ago...vertebrates 100 million years ago...human history beginning some 10 thousand years back.

We review the various energy sources. Oil, now the main source of industrial energy, is being consumed at a much faster pace than new deposits are being discovered. Its lifetime could be just another century more or less. Coal will last a few centuries longer, but most of it is high sulfur content, causing severe air pollution. Strip mining, by which 44 percent of the coal in the United States now is extracted, exerts a devastating impact upon land. The potential for hydroelectric power is substantial in undeveloped areas of South America, Africa, and Southeast Asia, but most dam sites already have been exploited in Western Europe and North America. Geothermal power is another possibility, but is limited to the availability of underground steam and does not appear to be the answer to the world's energy needs. Ocean tides contain enormous power, but there appear to be few suitable places where the energy can be harnessed. The sun, of course, is the ultimate source of all our energy except nuclear, but so far our technological concepts are not equal to capturing this power directly and converting it to our uses, at least in a practical, satisfactory way.

This leaves nuclear energy.

At present, the atom supplies only about 1 percent of the world's power, but by the year 2000, as much as half of the world's power may come from nuclear energy. Most nuclear plant reactors today use uranium 235, which is in short supply, but with second generation breeder reactors, nuclear fuel would be plentiful for thousands of years.

Nuclear plants do not emit air pollution, but they do give off radiation. A former New York City Environmental Protection administrator and now a professor of environmental medicine, Merril Eisenbud, says that people living in the vicinity of a nuclear plant probably would be exposed to less radiation in a year than passengers on one airplane flight from New York to Chicago. Nuclear physicist and science writer Ralph Lapp tells, on the other hand, of one remote but horrendous possibility, an uncontrollable runaway reaction in the uranium core "forming a great molten mass of glowing material which will go down into the earth. Experts who talk about this have a name which they somewhat humorously apply to it. They call it the 'China syndrome.'"

The other major environmental problem with atomic power plants is waste heat, thermal pollution. The nuclear plant heats water to make steam to turn turbines to drive generators to produce electricity. The spent steam must be cooled and condensed back to water for reuse in the plant's closed system...and water from an adjacent river, lake, bay is required for this job. But when that water is returned, it is hotter than it was originally, often causing great changes in the biological life in the body of water. Several experts discuss what limits should be placed on this thermal discharge, and what methods are appropriate for cooling the water before it is returned to its natural body. This still is one of the important areas for public discussion, litigation, and determination. Ralph Lapp believes that by the year 2100 we will require so many huge power plants that they will be built on artificial islands offshore in the oceans because so much water will be required for cooling.

Another unresolved problem is what to do with nuclear wastes, particularly those which are highly radioactive and will remain so for tens of thousands of years. One proposal has been to seal them in ceramic cylinders and bury them in salt deposits. However, it is pointed out that if water somehow reaches the area, then the sealing characteristic of the salt is destroyed.

Public issues lawyer Anthony Roisman says flatly, "Now that kind of a waste simply should not be produced. We can't use it, we cannot recycle it. We have no way to detoxify it. We simply have to live with it for 50,000 years and my own judgment is that that makes it an unacceptable kind of way to generate electricity."

Science writer Lapp says, "This is one of the great unresolved problems for the world. And I think that it's high time that international authorities got together and made this a high priority assignment because nuclear power is coming."

The broadcast then examines what nuclear power means to a developing country, India. Finally, off on the horizon is the promise of controlled fusion, the energy of the sun. Not yet perfected, scientists don't know if it ever will be; but it offers an almost limitless supply of fuel from the seas. However, there still will be problems -- management of the radioactive element, tritium; and the final limit -- that of the enormous waste heat which will be cast into the biosphere. Eventually the "waste" heat produced would melt the massive Antarctica ice caps and those of Greenland into waters which would flood highly productive lowlands where almost 50 percent of the human population lives at present.

This brings us back to the opening questions. When it comes to energy, we see that we must make evaluations, decide which trade-offs we want to make, and this gets back to deciding what kind of lives we want for ourselves and our children, how much weight to give to material things, how much to quality of living.

What can I do?

Perhaps the most important thing one can do when it comes to the subject of energy, particularly nuclear energy, is to learn -- to take to heart -- two of ecology's fundamental lessons. One is: you don't get anything for nothing. As ecologist Barry Commoner put it, "There is no free lunch." The trouble is we frequently do not recognize at first in what coin the payment must be made. When we finally are presented with the bill, we sometimes discover that costs far exceed benefits (who would knowingly, willingly have created the Dust Bowl of the 1930's?) or that a select few have benefited, while the majority must pay (as in the case of power plants that get rid of effluents free of charge to the detriment of our air and waterways). Economists have taken to calling these business "freebies" as "external costs," or "externalities."

This leads to the second ecological law: you can never do just one thing. There is an old axiom that the successful person "keeps his eye on the doughnut and not on the hole," and this may be a very valid rule for personal conduct. Certainly an individual must have a positive attitude in order to achieve what he sets out to do, but on the grand scale there is a flaw in this policy. Even if one ignores the hole, it does not go away. Negative effects of an action will not be avoided simply because they are not anticipated or intended. For years, many people have tried to downgrade unwanted or unintended effects to a second class status, calling them "side" effects, but as ecologist Garrett Hardin has pointed out: effects are effects.

What we must do is make a valiant attempt to assess all effects -- try to figure out the whole bill beforehand -- before we commit ourselves to a broad, possibly irreversible course of action. The use of energy merits such citizen examination. With each new form of energy, with each increment in the growth of power, man is further freed from physical labor, he can accomplish more work, his comfort is enhanced, his conveniences multiplied; but power is double-edged. As we have seen and will see elsewhere in this series (SCARS ON THE SURFACE, SIX FATHOMS DEEP, THE AIR WE BREATHE), the toll on environment and upon health also escalates.

With nuclear energy, the risks peak along with the benefits. As this broadcast brings out, as we diminish and then deplete fossil fuels, we must turn to other energy sources (it's either that or drastically reduce population and/or standard of living). At the moment, there appears to be no other recourse except nuclear energy. Then we will have to coexist with the threat of ever-mounting radiation hazards.[2] Is it fair to saddle our posterity with constantly-swelling, highly dangerous packages of radioactive wastes? Or will technology be able to solve this problem? Second-generation breeder reactors will mean a proliferation of plutonium, the explosive for atom bombs. How far are we willing to increase the risks of having such a substance get into the hands of extortionists, terrorists, or the mentally deranged? Controlled fusion power, not yet perfected, holds the promise of virtually unlimited fuel for power, but it also would bring a tremendous jump in waste heat. Alvin Weinberg, a nuclear physicist, told a scientific meeting that breeder reactor power plants could supply the energy needs for 20 billion people on the planet. The real questions are what would life be like with that many human beings, and what would the thermal pollution from 4,000 such power plants do to the environment? Shouldn't someone be making those calculations? Shouldn't we be making a greater effort to utilize solar energy, which is environmentally more compatible even if, at the moment, technologically more prohibitive? Of course, there's the other alternative: that we curb our energy demands. Shouldn't someone be adding up the total bill we will have to pay for energy...so that we, the people (and you, the individual), can make intelligent decisions on what course to take?

Everyone should become informed about the questions asked above because they have a profound bearing on the course of human civilization and what kind of lives our children's children and their children will live.

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[2] Two nuclear scientists, John Gofman and Arthur Tamplin, have charged that low level radiation at present is causing excessive cancer and leukemia deaths. It is a frustrating scientific argument, for the contention can neither be conclusively proved nor refuted scientifically.

For further information

Books

1. THE CARELESS ATOM by Sheldon Novick; Houghton Mifflin, Boston, 1969, $5.95. A careful critique of nuclear energy, as it impinges on environment.
2. RESOURCES AND MAN, National Academy of Sciences/National Research Council; W. H. Freeman, San Francisco, 1969, $2.95. See particularly M. King Hubbert's chapter on Energy Resources.
3. SCIENCE AND SURVIVAL by Barry Commoner; Viking, N.Y., 1967, $1.35. A critique of some scientific attitudes with emphasis on the atom.
4. NUCLEAR POWER AND ITS CRITICS: THE CAYUGA LAKE CONTROVERSY by Dorothy Nelkin; Cornell University Press, Ithaca, N.Y., 1971, $1.75.

Publications

1. MAJOR ACTIVITIES IN THE ATOMIC ENERGY PROGRAMS, an annual report by the U.S. Atomic Energy Commission. U.S. Government Printing Office, Washington, D.C. 20402. $1.75.
2. SOURCES OF TRITIUM AND ITS BEHAVIOR UPON RELEASE TO THE ENVIRONMENT by D. G. Jacobs; AEC Critical Review Series, 1968. U.S. Atomic Energy Commission. $3. About a dangerous by-product of nuclear fusion.
3. SEVEN WAYS TO REDUCE FUEL CONSUMPTION IN HOUSEHOLD HEATING, 1971, U.S. Government Printing Office, Washington, D.C. 20402 or Office of Consumer Affairs, Washington, D.C. 20506. 25¢.
4. ELEVEN WAYS TO REDUCE ENERGY CONSUMPTION IN HOUSEHOLD COOLING, 1971, U.S. Government Printing Office, Washington, D.C. 20402 or Office of Consumer Affairs, Washington, D.C. 20506. 30¢.

Articles

1. "The Biosphere," 11 articles on various energy and other cycles, SCIENTIFIC AMERICAN, September 1970. Also a Scientific American book published under the same title by W. H. Freeman, San Francisco, 1970.
2. "Energy and Power," 11 articles in a thorough discussion of the subject in SCIENTIFIC AMERICAN, September 1971.

3. "Nation's Energy Crisis" by John Nobel Wilford, a three-part series in THE NEW YORK TIMES, July 6-8, 1971. Good summary of the situation.

4. "The Price of Power" by Anthony Wolff, HARPER'S Magazine, May 1972. An excellent, brief summary of cost-benefits.

5. "Nuclear Energy: Benefits Versus Risks" by Walter H. Jordan, PHYSICS TODAY, May 1970. A physicist's view.

6. "Costs versus Benefits of Increased Electric Power" by Philip H. Abelson, SCIENCE, December 11, 1970. The view of the editor of SCIENCE.

7. "Statement of the National Coal Association to the Senate Committee on Interior and Insular Affairs, September 10-11, 1970." Discusses uranium and other energy reserves and need for an overall energy policy.

8. "Health and Safety Aspects of Nuclear Power. Choices that Confront Us," by Sidney J. Socolar and Edward J. Friedman, March 4, 1970. New York Scientists' Committee for Public Information, 30 East 68th St., New York, N.Y. 10021.

9. "The Four Big Fears About Nuclear Power" by Ralph E. Lapp, NEW YORK TIMES MAGAZINE, February 7, 1971.

10. "AEC's New Environmental Rules for Nuclear Plants" by Robert Gillette, SCIENCE, September 17, 1971.

11. "AEC to Referee, Not Promote, Industry," SCIENCE, October 29, 1971.

12. "Reactor Emissions: AEC Guidelines Move Toward Critics' Position" by Robert J. Bazell, SCIENCE, June 18, 1971.

13. "Gofman and Tamplin: Harassment Charges Against AEC, Livermore" by Philip M. Boffey, SCIENCE, August 28, 1970.

14. "Dear Sir: Your House is Built on Radioactive Uranium Waste" by H. Peter Metzger, NEW YORK TIMES MAGAZINE, October 31, 1971.

15. "Vermont: Forced to Figure in Big Power Picture" by John Walsh, SCIENCE, October 1, 1971.

16. "The Nukes Are in Hot Water" by Robert H. Boyle, SPORTS ILLUSTRATED, January 20, 1969. A forewarning of thermal pollution ahead.

17. "Thermal Pollution and Aquatic Life" by John R. Clark, SCIENTIFIC AMERICAN, March 1969.

18. "AEC to Build a Reactor Creating Power and Fuel," THE NEW YORK TIMES, January 15, 1972. On the fast breeder nuclear reactor program.

19. "Breeder Reactors: Power for the Future" by Allen L. Hammond, SCIENCE, November 19, 1971.

20. "The Great Breeder Debate," TIMES Magazine, November 1, 1971.

21. "The Fast Breeder Reactor: Signs of a Critical Reaction" by Allen L. Hammond, SCIENCE, April 28, 1972.

22. "Power Generation: The Next 30 Years" by R. W. Holcomb, SCIENCE, 167; 159-160, 1970.

23. "We're Running Out of Gas" by Ralph E. Lapp, NEW YORK TIMES MAGAZINE, March 19, 1972. On the depletion of natural gas reserves.

24. "Power from the Sun: Its Future" by Peter E. Glaser, SCIENCE, 162; 857-861.

Films*

1. THE NATURE OF LIFE: ENERGY AND LIVING THINGS, 14 min., Coronet Films, $175, b&w $87.50, grades 7-12. Shows that life is a process which needs energy and involves energy changes. Enables students to follow the amount of energy which enters the atmosphere and how it is used up and changed in form.

2. PROBLEMS OF CONSERVATION: MINERALS, 16 min., Encyclopedia Britannica Educational Corporation, color $200, b&w $102.50. Speculates on the using up of oil and other minerals.

Organizations

1. U.S. Atomic Energy Commission
Washington, D.C. 20545
For all inquiries related to atomic energy.

2. Joint House-Senate Committee on Atomic Energy
The Capitol
Washington, D.C. 20002

3. Radiation Office
Environmental Protection Agency
1626 K St.
Washington, D.C. 20460
For Federal environmental regulations.

4. Federal Power Commission
441 G St.
Washington, D.C. 20426
For conventional, nonnuclear power.

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* Addresses of film distributors are given at the end of the guide.

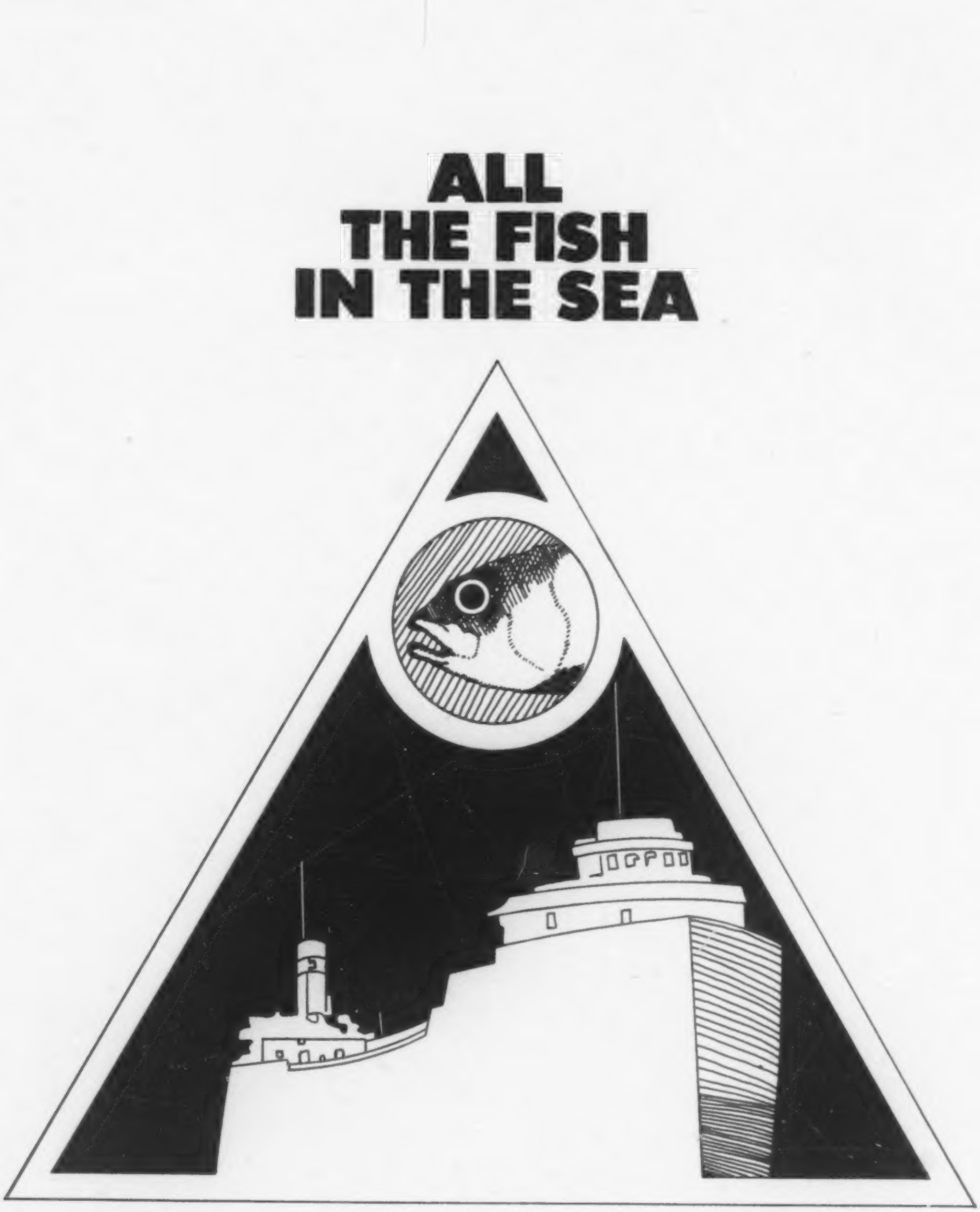
5. Department of the Interior
Washington, D.C. 20240
For inquiries about energy resources.

6. Committee on Interior and Insular Affairs
House of Representatives
and/or
U.S. Senate
Washington, D.C. 20002
For questions about energy policy.

7. Atomic Energy Information Service
P.O. Box 382
Canoga Park, Calif. 91304
In New York City, call Saul J. Harris (212) 264-2513.
This is an information service for writers and researchers in nuclear energy and radiation sponsored by the Atomic Energy Commission, Health Physics Society, American Nuclear Society, and Atomic Industrial Forum.

8. Scientists' Institute for Public Information
30 East 68th St.
New York, N.Y. 10021
For information about environmental effects of nuclear power.

ALL THE FISH IN THE SEA



71/72

ALL THE FISH IN THE SEA

Perspective

Sunday supplement writers have been fond of depicting the oceans as the last great preserve to which mankind will be able to turn in its hour of need to "farm" and harvest virtually illimitable food resources. Indeed, fish catches have expanded over the past three decades beyond the most optimistic of earlier forecasts. Where only 18 million tons of fish were taken from the oceans in the best year before World War II, the figure rose almost continuously and at a spectacular rate after the war so that in 1970 the worldwide catch had almost quadrupled the prewar optimum. The United Nations Food and Agriculture Organization reports that 69.3 million metric tons of fish were taken in 1970, a 10 percent rise over the previous year.

The FAO Yearbook of Fishery Statistics shows that Peru was the leading producer, with 12.6 million tons, up 25 percent from 1969. Japan was second with 9.3 million tons; the Soviet Union, third with 7.3 million tons; China, fourth; Norway, fifth; the United States, sixth.

The biggest increase of fish catches in recent years has been made by developing countries. With the aid of the United Nations Development Programme, these nations have expanded their catches from 8 million tons in 1958 to 28 million tons in 1970. This places them, as a bloc, ahead of the developed market countries (with 26 million tons) and the socialist countries (15 million tons).

While these figures encourage optimism, there have been danger signals along with the increasing productivity. In 1946, the California sardine fishery slumped and has never recovered; in 1950, it was the Northwest Pacific salmon fishery; in 1961, the Atlantic-Scandinavian herring.

Now the Newfoundland cod, North Sea herring and menhaden, the British Columbia herring, and the yellowfin tuna in the eastern Pacific show signs of pressure. The blue whale, the largest animal on earth, is in danger of extinction.

These fishery declines indicate that even though the world catch is greater than ever, the oceans are not as totally productive as they once were (overfishing is not the only factor in this reduced productivity; see SIX FATHOMS DEEP).

The declines serve as warnings that there is a limit to the amount of fish that may be harvested without reducing the stock and producing the "golden goose" effect. In an authoritative and comprehensive study of resources by the National Academy of Sciences, scientists have calculated what the maximum marine yield could be. It is slightly more than double the 1970 catch -- perhaps 150 to 160 million tons (predicated on the assumption, of course, that marine pollution does not cut present productivity). This would supply an extremely small percentage of the world's food energy although it could provide 30 percent of its protein requirements.

With the increasing fish catches, we are taking an ever greater percentage of "industrial" fish, suitable only for fishmeal. About half the world's catch now is processed in this way instead of being used directly for food. The dilemmas and problems of this relatively new maritime development are examined in this documentary.

The Broadcast: ALL THE FISH IN THE SEA

ALL THE FISH IN THE SEA documents the spectacular rise of Peru as a fishing nation, from 19th place to first in the world by the early 1960's, in the volume of fish caught (although not in revenue). The huge fish catch, off the West Coast of the South American country, was based on one species -- anchoveta, a small sardine which few people eat.

With the sharp rise of the anchoveta intake came a number of important ecological changes. By 1962, when Peru was hauling up 6 million tons of anchoveta per year, a new homegrown shipbuilding industry bloomed along with the fishing industry. New shipyards were turning out three vessels a day 7 days a week. Both industries meant new jobs for Peruvians. Peru also derived new income by manufacturing and selling fishmeal to the United States and nations in Western Europe. The anchoveta fishmeal became a leading export and earner of foreign exchange.

Growth was built into the process -- more boats meant more fish; more fish meant more revenue; more fish and revenue encouraged more boats. By 1967, the anchoveta catch was 12 million tons a year, but with this growth came alarm signals.

One of them was a fear that the burgeoning of the fishing industry threatened one of Peru's older export industries: guano, the excrement of birds that feed mainly on anchoveta and a commodity eagerly sought as fertilizer. As it turned out, this fear was not realized. The guano fertilizer industry was able to coexist with the flourishing fishing industry.

Marine biologists sounded an even more serious warning. The anchoveta harvest would have to be cut to seven and a half million tons a year if the stock were to maintain itself. Larger profits in the short run would mean extinction of the base of the industry in the long term.

In one of the forward-looking and heartening developments of this young ecological era, Peru has instituted regulations and quotas, and the anchoveta catch in 1969 was reduced to 9 million tons a year. (The fact that the catch rose to 12.6 million tons in 1970 does not mean a relaxation of this policy. The Institute of the Sea in the Ministry of Fisheries, which closely watches the stock, decided that the larger catch was permissible without injury to the fishery.) The mistakes of overfishing committed in the Mediterranean and off the coast of Europe are not to be repeated off the coast of Peru.

Curtailment of the fish harvest led to problems. For one, the shipbuilding industry kept making boats that were no longer needed, kept increasing fish-catching potential which, if utilized, would be detrimental.

The basic dilemma for Peru is that in order to get the best prices, 95 percent of the anchoveta are turned into fishmeal and most of that goes to feed cattle, pigs, and chickens in Europe and the United States; so the major portion of Peru's great protein wealth ends up as beef, pork, and poultry for protein-rich Europeans and Americans. Only 17 percent of Peru's fish protein goes to feed the hungry people of the world, and, greatest irony of all, very little goes into the bellies of Peruvians. The people of the world's leading exporter of fish protein eat less protein than peoples of all other nations except one.

As a final twist to this story, it is difficult to tempt people even in protein-short nations to eat fish protein concentrate (FPC) because the texture differs from customary staples. Some scientists now are trying to solve the riddle posed by Tristram Shandy two centuries ago -- _de gustibus non disputandum_, there is no accounting for taste -- by experimenting with tastier, better-textured FPC.

What can I do?

Perhaps the most important thing you can do in this case is to learn the lesson of the broadcast and take it to heart.

The Peruvian story is a parable for our times, showing first of all, how interwoven are the threads of human affairs with natural resources and the environment. Peru's economic fortunes rise, foreign interest quickens, new domestic industries flourish, another is threatened, the very base of the new wealth must be calculated, the nutrition of the people weighed against economic progress.

Secondly, the story demonstrates that there usually are no quick solutions; rather, one development leads to another complication or problem or dilemma. Protein-poor Peru's exploitation of the anchoveta fishery brings nourishment to the Peruvian economy, but the protein goes to the already protein-rich Western societies. Even when additional protein is made available, it may be rejected by a population because it does not fit into normal eating patterns.

Thirdly, there are no simple or easy solutions to many of today's ecological dislocations or abuses. On the one hand, the human population needs more food, particularly more protein; on the other, we must be more careful than we have been in the past not to kill the "golden goose" by overfishing. But we have been notably unsuccessful in showing restraint in the exploitation of a common resource. The depletion of fisheries cited in the Perspective are examples of international failure; the same failures are repeated on the intranational scale as well. Each costal state of the United States exercises jurisdiction of fisheries out to the 12-mile limit. Fish, however, do not observe state boundaries in their migrations. New York State no longer has a menhaden fishery largely because of overfishing in Chesapeake Bay. Even within state waters a similar principle is in operation with the result -- according to Dr. John McHugh of the Marine Sciences Research Center at State University of New York, Stony Brook -- that no fisheries within United States waters are well managed.

This principle was set forth by ecologist Garrett Hardin in "The Tragedy of the Commons." Hardin chose as his "commons" a pasture shared by a number of herdsmen. Each herdsman considers adding another steer to his herd and asks what would happen if he does so. On the negative side, he reasons there would be a slight increase in overgrazing, but that would be prorated among all users of the commons. On the positive side, he would have one more fatted steer, and he alone would benefit.

> The rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another; and another...But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit -- in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons.

This principle can be seen at work in air pollution -- where each factory, each apartment house incinerator, each person with his automobile or air conditioner dumps his waste exhaust and heat into the common reservoir of air -- as with water pollution and solid waste problems.

In the matter of international fishing -- overfishing -- the situation is especially acute. Hopefully, a United Nations Law of the Sea Conference in 1973 can bring international order and regulations to this vexing problem.

In the meantime, there is a dearth of places even to register a meaningful protest. On the international level, write to

Director
Fishery Resource Division
Food and Agriculture Organization
Via delle Terme di Caracalla-00100
Rome, Italy

On the national level, write to the President at the White House.

For further information

(See SIX FATHOMS DEEP for information about marine pollution)

Books

1. RESOURCES AND MAN, National Academy of Sciences/National Research Council; W. H. Freeman, San Francisco, 1969. See particularly the chapter "Food From the Sea."
2. TOO MANY: A STUDY OF EARTH'S BIOLOGICAL LIMITATIONS by Georg Borgstrom; Macmillan, N.Y., 1969, $7.95.
3. THE HUNGRY PLANET by Georg Borgstrom; Collier, N.Y., $2.95.
4. THE PACIFIC SALMON FISHERIES, a study of irrational conservation by James A. Crutchfield and Giulio Pontecorvo. Published for Resources for the Future by the Johns Hopkins Press, Baltimore, 1969, $6.
5. THE YEAR OF THE WHALE by Victor Scheffer; Scribners, N.Y., 1969, $1.45. An absorbing book on the big creature.
6. THE LIFE OF THE OCEAN by N. J. Berrill; McGraw-Hill, N.Y., 1966, $4.95. Good simple, well-illustrated account of ecology of oceans and their relation to man.
7. THE LIFE OF THE SEASHORE by William H. Amos, McGraw-Hill, N.Y., 1966, $4.95. Ties ecology of shores to oceans and to man.

Publications

1. TOWARD FULFILLMENT OF A NATIONAL OCEAN COMMITMENT, a report by the National Academy of Engineering, Marine Board, 2161 Constitution Ave., Washington, D.C.

Articles

1. "The Ocean," 10 articles devoted to various aspects of the ocean, SCIENTIFIC AMERICAN, September 1969. Fine for information on fisheries and the rest.
2. "Crisis at Sea: The Threat of No More Fish" by Robert Brigham, LIFE, December 3, 1971. An excellent article on the problems of overfishing and what can be done about it at the Law of the Sea Conference in Geneva in 1973.
3. "Needed: Effective Management of Our Priceless Shorelines and Estuaries," CF LETTER, May 1970. The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C.

4. "Where Have the Herring Gone?" by Jean Hewitt, THE NEW YORK TIMES, February 14, 1970. On shortage of herring and other species.

5. "The Tragedy of the Commons" by Garrett Hardin, SCIENCE, December 13, 1968.

Films*

1. TOMORROW'S WORLD/MAN AND THE SEA, 52 min., color, Contemporary Films/ McGraw-Hill, $600, rental $35. Marine science in terms of oceanography and other aspects.

2. THE TRAGEDY OF THE COMMONS, 23 min., King Screen Productions, $295, rental $35, grades 7-adult. A story of what happens when people overuse a common resource.

3. THE DEEP FRONTIER, 25 min., color, Contemporary Films/McGraw-Hill, $325, rental $18. Exploration of the ocean floor in a deep diving submarine.

Organizations

1. Fishery Resources Division
Food and Agriculture Organization
Via delle Terme di Caracalla-00100
Rome, Italy
The best source for international statistics, regulations, conventions. Virtually the world's only central agency on this subject. Some statistics and information available from FAO at United Nations headquarters in New York.

2. National Marine Fisheries Service
National Oceanic and Atmospheric Administration
U.S. Department of Commerce
Washington, D.C. 20235
This agency has probably the best chance of coordinating U.S. fishing regulations.

3. Oceanographic Institution
Woods Hole, Mass. 02543

4. Marine Sciences Research Center
State University of New York
Stony Brook, N.Y. 11790

5. Inter-American Tropical Tuna Commission
Scripps Institution of Oceanography
La Jolla, Calif. 92037
For information about tuna catches, regulations.

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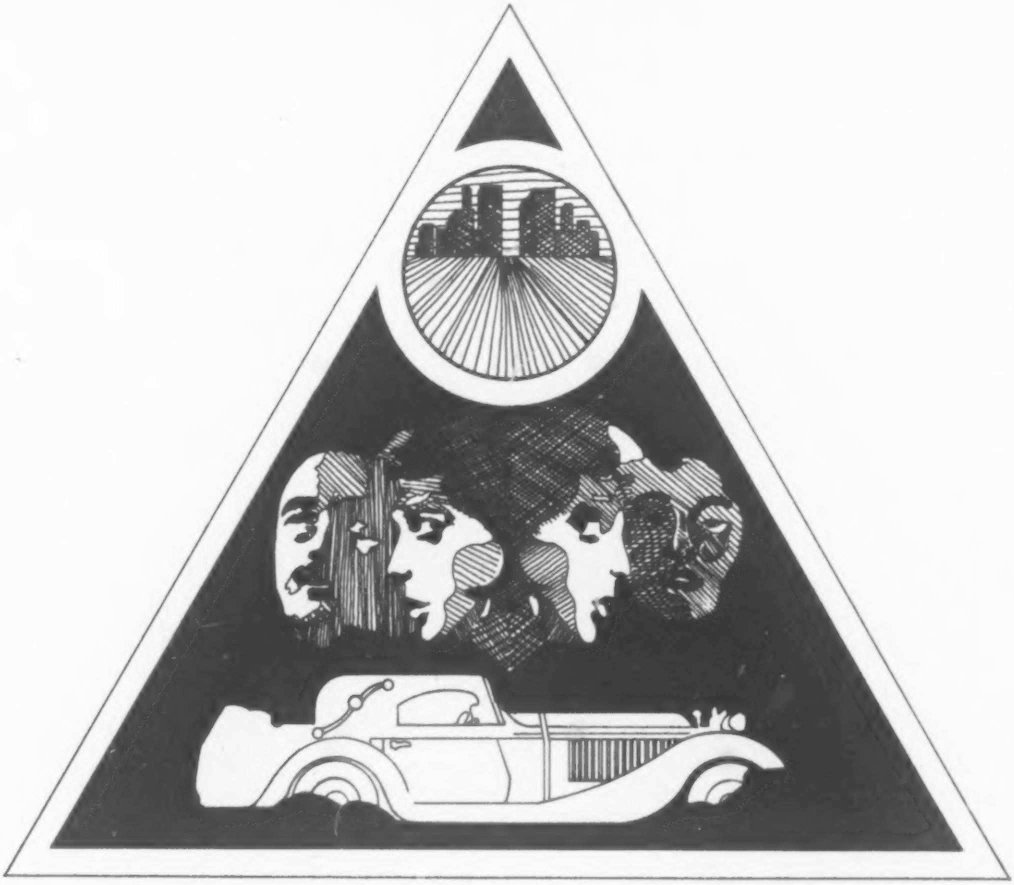
* Addresses of film distributors are given at the end of this guide.

6. Merchant Marine and Fisheries Subcommittee on Oceanography
U.S. House of Representatives
Washington, D.C. 20515

7. Subcommittee on Oceans and Atmosphere
U.S. Senate
Washington, D.C. 20510

THE CAR IN THE CITY



83/84

THE CAR IN THE CITY

Perspective

History tells us that Morse invented the telegraph, Bell the telephone, and Edison the electric light; but when it comes to the automobile, so many men had a hand in its perfection over such a long period of time that the Encyclopedia Americana says "it seems preferable to assume the existence of an ancient dream of such a vehicle and to describe simply the principle steps of its realization." An ancient dream of a vehicle that could take men wherever they want to go on land without effort on their part or the part of animals. There have been many changes in the 20th century, but the automobile remains the darling of the transport systems, and unexcelled when one wants to travel from portal to portal in an uncongested area while enjoying personal privacy and a desirable environment.

But with today's population of autos -- still growing -- the price for these conveniences becomes ever more expensive. Is the price too high? Are cars the seeds of dissolution of our cities? While the populations of most cities have declined, suburban populations have swelled. Prosperity has gone the same way. As fast as suburban populations have grown, the populations of suburban autos have grown even faster. While the human population of Westchester County has expanded 10 percent in the past 10 years, the number of Westchester autos has increased 50 percent; in Long Island, the number of people increased 110 percent, the number of cars 193 percent.

If one automobile is beautiful, can a billion cars doom a civilization? Maps of Los Angeles show that two-thirds of the city is either roadway or parking facilities. About two-thirds of all urban air pollution is caused by autos. The growth of autos in New York City, air conditioned autos (and air conditioned buildings) has resulted in a tremendous growth in waste heat which in the summertime reminds one that the road to hell is paved with good intentions. Any solution to the problem of the auto transport system must be tempered by the knowledge that economically our society is deeply involved with that system: one out of seven workers in the United States depends on the auto industry for his livelihood; municipal, state, and Federal governments derive more than $11 billion annually from auto taxes and highway tolls.

This leads to one of the fundamental questions facing us. Are we prisoners of our technology? Are machines meant to serve men or are men made for machines?

This broadcast does not directly investigate this basic, philosophic question; nevertheless it does point the way toward an answer as well as some pragmatic solutions to the specific question to which it is addressed.

The Broadcast: THE CAR IN THE CITY

THE CAR IN THE CITY addresses itself to the question posed by British science writer Lord Ritchie-Calder at the end of the film: are the car and the city compatible?

At the outset, college professor and transportation expert William Seifert spells out why the auto is such a popular transportation system: "The automobile is a convenient sized package. People can own them. They come in red and blue and pink. They can go when they want, they can go where they want, they can go with whom they want."

But autos are the major source of urban air pollution and because there are so many of them, they become an increasingly ineffectual means of transportation in a city. New York City Environmental Protection

Administrator Jerome Kretchmer leads a demonstration outside an auto show to impress manufacturers that "the car is strangulating the city and we want to deal with that problem."

Nader raider John Esposito says that it is natural for the auto makers to resist change, to continue to emphasize "speed, style and sex." After all, these have been selling 10 million cars a year and have put 90 million autos on the road -- nearly one for every other American man, woman, and child. Charging that this is an inefficient way to move people, Esposito calls for the immediate building of mass transport systems which are efficient, inexpensive, and nondehumanizing and also for a 10 to 15 year moratorium on building highways. "In the short run I think we are going to have to talk about limiting the use of the automobile in the inner city areas."

Helen Leavitt, author of Superhighway -- Superhoax, is another critic of the car in the city. She says that autos cause 60 percent of urban air pollution and 85 percent of the contamination in her native Washington, D.C. In addition, 60 percent of a city's central business district is devoted to highways and parking areas. Overall, this auto-space accounts for 35 percent of all urban areas -- virtually a vacuum, she says, when it comes to providing tax revenues for city dwellers. She advocates "literally banning automobiles in the city."

Fresno, California, is one city that has barred the auto from a few downtown blocks by creating a combination of modern shopping center and old village green. The question of converting to such malls confronts city fathers the world over.

With the Clean Air Act of 1970, the Federal Government ordered a 90 percent reduction of hydrocarbons and carbon monoxide by 1975 and of nitrogen oxides by 1976. A General Motors engineer, Jim Gumbleton, explains some of the steps industry is taking to meet the Federal standards.

William Lear is critical of the auto industry's campaign to clean up the internal combustion engine, charging that there is an insuperable weakness in the cleaning paraphernalia itself. He says the only way to beat auto pollution is by using an engine that is inherently clean, such as his own steam engine.

A coast to coast race sponsored by the M.I.T. Clean Air Race Committee demonstrated that while it isn't easy, a reliable, low-pollution auto engine can be built. There are alternatives to the internal combustion engine. It also showed that the university can compete with industry in developing the necessary new technology.

That still leaves the basic questions raised by Lord Ritchie Calder: Will we still want to use autos in the city in the future? Are the car and the city compatible?

What can I do?

The auto system is an extremely inefficient way to move people in an urban area. The auto uses 10 to 50 times as much land as the train. A maximum of 3,000 auto passengers an hour can move over a 12-foot-wide highway lane whereas 60,000 riders an hour can be transported by train over a similar land strip. A train moves its carload of passengers at one-tenth the expenditure of energy per passenger of an automobile.

Unquestionably, an increase in public mass transit facilities and riders is a key to improving the urban environment. Yet, with each subway and bus fare increase, the number of passengers declines leading to a loss of revenues...which is met by another fare increase, perpetuating the downward spiral in passengers. This is accompanied by deterioration of service, fewer trains or buses at off hours, and an increase in the use of private vehicles. Every city person should be aware of this cycle and understand that the spiral must be broken.

If every urban and suburban dweller's best interests lie in promoting mass public transit, a first step and basic way of doing so is to patronize it wherever and whenever possible. Campaign for new public transit facilities and against fare increases. Support bond issues for mass transit. Vote for political leaders who support public transit, who oppose fare increases, and who advocate ways to make mass transit attract more riders. Write to your congressman and senators to free the Federal highway trust fund for use in mass transit.

You can reexamine your attitude toward the automobile. Is it really necessary for your family to have two or more autos? Is it a crutch for your ego? Do you still regard it as a status symbol for yourself or somebody else? Since no one can drive fast in the city anyway, big horsepower, high compression engines are unnecessary for city driving. Various moderate speed and low polluting engines are desirable, and you can be sympathetic toward innovations in that direction.

Rome, Italy, is experimenting with a carrot-stick approach: eliminating fares on street cars and buses during rush hours and banning autos from the central part of the city. Montpelier, France, is experimenting with drive-yourself taxis. Any such thoughtful efforts deserve your consideration and, with your acceptance, advocacy for your community.

If you drive to work, go by car pool.

If you must drive, use unleaded gasoline with the lowest octane possible. Keep your car well tuned. Stop ferrying your children to their appointments -- let them cycle or walk.

Try bicycling to work or the library or other errands. Races in Washington, D.C., showed that except for main arteries, one could travel city streets faster by bike than by auto. Bicyclists now have acquired some 15,000 miles of bikeways in the United States, most of the territory recovered from the automobile. There are 61 million bicyclists, making cycling America's leading outdoor recreational pastime.

Walking, under certain conditions, also is competitive with the automobile in the city at rush hour as a means to move short distances. Walking is the most healthful mode of transportation ever invented. It should help you to live a long life, if as a pedestrian you can avoid the automobiles and their fumes.

For further information

(See also THE AIR WE BREATHE for additional information on air pollution)

Books

1. VANISHING AIR by John C. Esposito; Grossman, N.Y., 1970, 95¢. Nader group's report on air pollution.
2. SUPERHIGHWAY -- SUPERHOAX by Helen Leavitt; Doubleday, Garden City, N.Y., 1970, $6.95. An irate lady's case against the auto.
3. DEAD END: THE AUTOMOBILE IN MASS TRANSPORTATION by Ronald A. Buel; Prentice-Hall, Englewood Cliffs, N.J., 1972, $6.95.
4. THE CITY IN HISTORY by Lewis Mumford; Harcourt, Brace, N.Y., 1961, $15, softcover $4.95. On what a city is and what makes it that way and what cities should be.
5. THE ECONOMY OF CITIES by Jane Jacobs; Vintage-Random House, N.Y., 1969, $1.95. The classic on the economic forces that mold cities.
6. URBAN DYNAMICS by Jay W. Forrester; M.I.T. Press, Cambridge, Mass., 1969, $12.50. A systems analysis of why cities grow, decline, and ail.
7. THE MAGIC OF WALKING by Aaron Susman and Ruth Goode; Simon and Schuster, N.Y., 1967, $7.50. A guide to the joys of walking.

Articles

1. "While Detroit Works to Control Auto Emissions, Others Look to Different Types of Engines and Restrictions On Auto Use," CF LETTER, April 1972. The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C. 20036.

2. "U.S. Agency Bars Delay On Cutting Pollutants" by E. W. Kenworthy, THE NEW YORK TIMES, May 13, 1972. Contains a good summary of the Clean Air Law.

3. "Clean Auto Engine by '75 Termed Possible by Panel," THE NEW YORK TIMES, January 6, 1972. Judgment of a committee of the National Academy of Sciences.

4. "Ford Calls Clean-Air Goal 'Impossible Task' in Cities" by Jerry M. Flint, THE NEW YORK TIMES, May 27, 1971. Henry Ford 2d says 1975 deadline cannot be met.

5. "Planners Worried by Suburban Auto Glut" by David Andelman, THE NEW YORK TIMES, January 3, 1972. Auto population explosion in suburbia.

6. "Rome to Drop Rush-Hour Fares; Plans to Bar Autos from Center" by Paul Hofmann, THE NEW YORK TIMES, March 31, 1972.

7. "Results of French Traffic Tests Fair to Muddling" by John L. Hess, THE NEW YORK TIMES, November 15, 1971. A roundup of experimental remedies.

8. "Car Engine Woes Rise," THE NEW YORK TIMES, January 23, 1972. On problems with antipollution devices.

9. "Auto Exhaust, Pollution and Weather Patterns" by Vincent J. Schaefer, BULLETIN OF ATOMIC SCIENTISTS, October 1970.

10. "Steam Bus Is Tested On Coast" by Robert Lindsey, THE NEW YORK TIMES, January 23, 1972.

11. "Jersey Orders Yearly Test for Car-Exhaust Pollution" by Ronald Sullivan, THE NEW YORK TIMES, January 7, 1972.

12. "The Little Engine That Could Be An Answer to Pollution" by George Alexander, NEW YORK TIMES MAGAZINE, October 3, 1971. On the Wankel.

13. "First 'Clean' Cars Cross West Coast Finish Line" by Gladwin Hill, THE NEW YORK TIMES, August 30, 1970. On the clean car race.

14. "Ford Capri Wins 'Clean Car' Race," THE NEW YORK TIMES, September 2, 1970.

15. "What Is the Role of the Highway in Society and the Environment?" CF LETTER, June 1970. The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C.

16. "Highway Fund: In Goes Money, Out Comes Concrete" by Wade Green, THE NEW YORK TIMES, January 16, 1972. On the highway trust fund. The interstate highway system costs $45 billion at this point.

17. "Let's Put Brakes on the Highway Lobby" by George Denison and Kenneth Tomlinson, THE READERS DIGEST, May 1969.

18. "Interstate Highways: Life Changes in Their Paths" by Douglas E. Kneeland, THE NEW YORK TIMES, September 21, 1970.

Films*

1. THE POISONED AIR, 50 min., purchase Carousel, rental University of Minnesota, University of California, Pennsylvania State University, University of Arizona, Roa's Films. A CBS News production balancing the soothing views of the auto and petroleum industries with those of Senator Muskie, John Gardner, and a former Los Angeles smog control director.

2. MAN AND THE MACHINE: A ROMANCE GOING UP IN SMOKE, 15 min., Scott Foresman, $180, rental $20, grades 4-adult. Discusses historical development of auto, attempts to control technology with some of the more recent innovative ideas.

3. AUTOS AND ALL THAT TRAFFIC, 25 min., color, Contemporary Films/McGraw Hill, $350, rental $18. Produced by CBS for 21st Century, film discusses air pollution, traffic problems, new cars to be developed.

4. BOOMSVILLE, 10 min., Learning Corporation of America, $125, rental $15, grades 1-9. An animated overview of the growth of cities showing what man has done to his environment.

5. AUTOS, AUTOS EVERYWHERE, 26 min., color, Contemporary Films/McGraw-Hill, University of Southern California, Indiana University, Kent State University. Cars of the future to solve today's problems. Produced by CBS for the 21st Century.

6. CITIES IN CRISIS: WHAT'S HAPPENING, 22 min., color, Michigan State University, University of California, New York University, University of Arizona. Film argues that city problems are "above all, moral"; it offers a good basis for discussion.

7. THE CITIES: A CITY IS TO LIVE IN, 54 min., color or b&w, Bailey-Film Associates or Pennsylvania State University. A broad look at cities and their evolution with such experts as Lewis Mumford and Gunnar Myrdal.

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* Addresses of film distributors are given at the end of this guide.

8. CITIES OF THE FUTURE, 25 min., color, Contemporary Films/McGraw-Hill, $325, rental $18. Discusses how growing urbanization has brought pollution, slums, congestion, and some approaches toward solutions. Produced by CBS for 21st Century.

9. Automobile Club of New York Film Library
38 West 32d St.
New York, N.Y. 10001

Organizations

1. U.S. Department of Transportation
800 Independence Ave., SW
Washington, D.C. 20590

2. Automobile Manufacturers Association
Detroit, Mich. 48202

3. Automobile Association of America
Madison Ave. & 79th St.
New York, N.Y. 10021

4. Automobile Club of America
4 Park Ave.
New York, N.Y. 10003

5. American Petroleum Institute
Washington, D.C. 20006

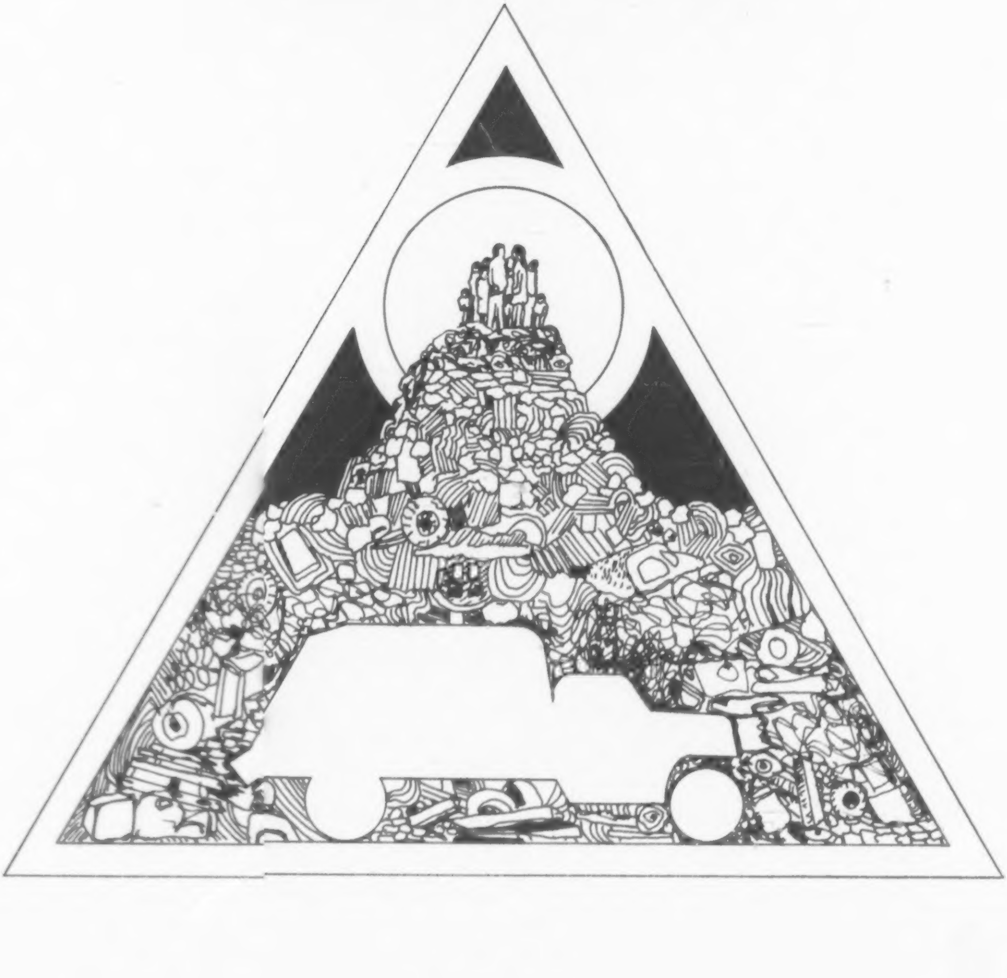
6. Air Pollution Control Office
Environmental Protection Agency
1626 K St.
Washington, D.C. 20460

7. Department of Air Resources
Environmental Protection Administration
Municipal Bldg.
New York, N.Y. 10007

8. Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201

9. Citizens for Clean Air
502 Park Ave.
New York, N.Y. 10022

YOU CAN HELP–
THROW IT HERE



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YOU CAN HELP — THROW IT HERE

Perspective

When one thinks about it, the closed system of nature is a remarkable mechanism -- nothing accumulates out of proportion. The oceans and animals, and now man and his machines produce enough carbon dioxide for green plants which return oxygen for man, animals, and machines. The balance stays quite constant; about 21 percent of our atmosphere is oxygen, about .03 percent carbon dioxide. Whether nitrogen, phosphorous, iron, or calcium, the elements recirculate through living things and back through the air, water, or earth in what ecologists call biogeochemical cycles.

Quite literally one organism's poison is another's food. Bacteria feed on feces and cadavers, and it is fortunate for us that they do. This perfect match-up seems miraculous at first glance, but becomes understandable when one considers that billions of years of evolution have afforded the chance for many creatures to develop and make use of the earth's varied resources.

Enter man. We are creating a host of synthetic materials that are new to nature (some may have existed at one time but were discarded). Or we separate naturally occurring compounds, which may be innocuous or inert, into their components which may be dangerous by themselves; for example, taking chlorine out of salt or seawater. These substances are removed from the natural cycle. Plastics, for example, are not broken down naturally and can exist for an extremely long time. The very reason for DDT's effectiveness is that it takes so long to break down and disappear in the environment.

On the other hand, we create materials that are degradable in such quantities that natural systems are overloaded. Hence the effluvium — smog, sewage, junk and garbage -- around our cities. We call the excess, pollution.

Also, we have a cultural value system whereby we rate objects for certain kinds of utility. We invest them with a value that can be withdrawn, modified, reinstated. The glass-shaded brass lamps popular during the age of kerosene were discarded with the advent of electricity, but later returned to countless living rooms as antiques. The horse population has been drastically reduced in the United States; where once it was a principle means of transportation and farmwork, today it is an animal used for recreation and racing. Initially, television sets were so expensive that when some part of the system failed, set owners had it restored to working order, giving birth to a vigorous television repair industry. As the price of sets came down and the costs of labor and TV repairs went up, owners reacted to a set failure by disposing of it and buying a new one. A similar "junking" of autos occurred as the cost of collision repairs skyrocketed. Such vehicles became ineligible for resale; they were consigned to junkyards, scrap heaps, or to litter city streets and countryscapes.

If we decide something is useless, it becomes known as "waste." Waste is expelled from the human recycling system of using, buying, selling, trading, giving, and thereafter ignored. Ignored, that is, until recently, when the twin problems of waste and pollution began to interfere with the functioning of society.

Fourthly, man like other animals has ingrained habits that militate against neatness. It is not difficult to understand why. For all of time, animals have relied without realizing it on nature to get rid of whatever was unused, unneeded, or unwanted. Seeds that were not eaten took root and grew into next year's plants. In the case of our distant ancestors, who were aboreal, "The trees offered a built-in sanitation and refuse system. Whatever was discarded, it all fell neatly to the ground -- excreta, nutshells, pods, hair-droppings... On the ground below, the humbler scavengers and the processes of decay soon dissipated all such materials and returned them to the soil."[1]

But as human settlements became more populous and concentrated, they began to overtax the natural processing system. Middens are prehistoric refuse heaps -- piles of bones and shells that mark where human communities once existed. These middens have proved to be treasure troves for anthropologists seeking the story of our past. They also tell us that the problem of waste disposal is probably as old as man, both having come into existence at about the same time.

The Broadcast: YOU CAN HELP -- THROW IT HERE

YOU CAN HELP -- THROW IT HERE looks at the worldwide problem of trash, junk, garbage, litter -- waste and its disposal. The questions it asks are what is it, why is it, what can we do about it?

There is an Alice in Wonderland quality to waste. It exists, we know only too well, but it could vanish like the Cheshire cat. This characteristic is alluded to at the outset by the noted science fiction writer Arthur Clarke when he says, "I don't believe in the existence of waste. There's only raw material which we're too stupid to be able to use."

Later it is brought out that we make waste, both in deciding what is valueless and therefore to be discarded and then physically taking a substance that is not objectionable in itself -- a piece of newspaper or writing paper or empty cereal box -- and mixing it with other kinds of materials in a garbage can. Then the whole melange becomes repugnant and burdensome. "What is garbage?" asks Maurice Strong, secretary-general of the United Nations' Stockholm Conference on the Human Environment. "The word garbage applies to the residues which we don't use. But when we start to use these residues, they'll no longer be garbage."

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[1] NOT SO RICH AS YOU THINK by George R. Stewart (see Books).

The United States, the world's most productive society, of course, also leads in the production of refuse and has not yet solved the problem of what to do with it all. Half of the waste in the United States consists of paper, one-third of the waste is some form of packaging. Most municipal refuse is burned...either in incinerating plants or in apartment house incinerators...adding, of course, to air pollution. Waste, naturally, must go somewhere. If not into air or water, then onto land. Land pollution to some extent is overcome through sanitary landfill, a method used by New York City at Fresh Kills, Staten Island. The problem with this practice is that suitable sites become filled and in metropolitan areas, such as New York City, no more landfill areas are available. Near Chicago, one ingenious solution was to build Mount Trashmore, a mountain made of garbage, for recreational ski and toboggan runs. This is only stopgap.

What must be done, and in the near future, says New York State's Commissioner of Environmental Conservation Henry Diamond, is "get as close to the closed system as possible." Virtually everything must be used again, recycled, remade, so that what is ultimate waste amounts to only 2 or 3 percent of the original. Elaborating on this theme, Maurice Strong points to the need for a new kind of information system, one which would give an inventory of the residues of one industrial operation so that they could be used as raw materials for other systems.

The Urban Refuse Research Center near College Park, Maryland, experiments with processing incinerator residues. Its research has shown that from 80 to 85 percent of the material can be reclaimed. Using conventional methods, the plant screens iron, steel, and nonferrous metals. Its researchers have made new, usable glass from waste, unusable glass; have made brick from 70 percent waste glass and 30 percent clay; and have shown that the operation can be run profitably. A number of cities have shown an interest, but the huge capital costs involved have blocked construction of such a working plant.

Other recommendations for solving the solid waste problem: more government-encouraged research, government priority to recycled materials in its purchasing policy, and a similar high-priority program by industry to use more recycled products and by-products.

That still leaves what the individual can do to help, and the broadcast looks at what one family is doing. The Wentworths have cut their garbage in half by putting such vegetable matter as lettuce, egg shells, coffee grounds, grapefruit sections, and banana peels into a compost; removing the labels from and cleaning bottles and cans, flattening the cans, collecting both separately and then recycling them both; and recycling newspapers as well.

What can I do?

In a nation and age of affluence, the old adage about "waste not, want not" seems to have been turned topsy turvy. Yet the national waste disposal bill is $4.5 billion for municipal costs alone, a tariff of billions more is levied by air pollution, and some resources like copper already are in short supply. It is almost certainly true that the old adage holds, but we have simply not toted up the whole bill.

While the problem, like the residues, is enormous and still growing, it is important to think small. Here is an area where the individual can make a difference. Simply by doing nothing. That is, not doing something. The difference between littering and tidiness is in the individual's mind. It is a matter of attitude...training...example...and trillions of individual decisions. Not to drop the wrapper, not to jettison the empty can from the speeding car, not to discard the no-longer-needed paper bag instantaneously, but to deposit them in proper receptacles. Instruct your children -- by example as well as edict -- not to litter.

Appreciate that the earth, all of it, is our home, the Greek oikos from which we get the word ecology. We must train ourselves to regard it as home. Take part in a block party. Lead a cleanup drive.

Having said this, having paraphrased the popular advertising slogan "People make pollution, people can stop it," let us go on to suggest that the individual is not alone in this affair. The consumer could receive a big assist from manufacturers, market people, packagers, retailers, salesmen, and advertisers. Excessive packaging is an inherent part of the blight. Nonreturnable bottles serve the convenience of the supermarket and manufacturer as well as the consumer who alone pays for the added cost. That additional cost is staggering and rarely calculated in public.

American consumers paid some $25 billion in 1966 for packaging, 90 percent of which was discarded.[2] Since then, the packaging industry has grown, with entrenched interests opposed to change. The purchase price of soft drinks in throwaway glass is 30 percent more expensive than when it is sold in returnable containers. It is estimated that consumers would save $1.4 billion a year if returnable bottles were restored. It takes three times more energy to produce nonreturnable bottles, and throwaway cans are

[2] Bureau of Solid Waste Management, "The Role of Packaging in Solid Waste Management," Environmental Protection Agency, Washington, D.C., 1969.

only slightly less costly in terms of energy. This is without counting the fact that consumers are forced to dispose of 50 billion bottles and cans a year and (as taxpayers) to pay for the efforts of public disposal systems.

Can we afford throwaway anything? Is the price right for planned obsolescence?

There is a very effective way to change the habits of people who sell things: that is not to buy their products. And tell them why. Conversely, help the people doing the right things -- go out of your way to buy products in returnable containers. Deliberately buy simply packaged items. Patronize a dairy that uses returnable bottles. Complain to supermarket managers about excess packaging and lack of returnable containers; persistent complaints may even be heeded.

Our shopping habits also could be reexamined. In the broadcast, New York State Environmental Conservation Commissioner Henry Diamond said almost wistfully, "When a European housewife goes to market, she might have a net bag and she gets a loaf of bread and sticks it in that and fish maybe wrapped in newspaper, and gets some fresh vegetables. She comes back and she's got very little packaging. The American housewife, in getting the same food, the same meal, comes back with plastics and cans and cardboard and that all goes out in solid waste."

Use a shopping bag.

You also can:

Recycle newspapers, bottles, cans. (But remember that recycling bottles is not nearly as efficient nor as economical as reusing returnable bottles.) If your community does not have facilities for such recycling, find out why and talk to local political leaders. Bring the matter to the attention of your local newspaper and radio station. Help start such a process.

Wherever possible, avoid use of disposable plastic and paper plates and cups. Change to china and metal utensils. Use cloth instead of paper napkins. Use old cloths instead of paper towels for cleaning. One prominent Washington lady wrapped her Christmas packages, attractively, in newspapers. Another used no wrapping -- just a ribbon. Keep a blackboard instead of a pad by the telephone for notes. Use the backs of used envelopes to make shopping lists and other notes. Write on both sides of a paper. Do not use disposable diapers. Discourage "junk" mail by writing "return to sender" on unopened envelope. Remind yourself that paper is not free or even cheap, but comes from one of our most precious resources -- trees. Every ton of paper recycled means the sparing of 17 oxygen-producing trees.

Build your own compost heap, both as a means of garbage disposal and to provide organic fertilizer for your garden. A compost is any mixture of decomposed organic matter -- weeds, hedge clippings, leaves, coffee grounds, tea leaves, vegetable leftovers, pet droppings (but no bones or meat for they attract rodents) -- with earth and used as a fertilizing compound. A good ratio would be two parts organic matter, one part manure, one part topsoil. Compost heaps can be contained in bins, holes, trenches, trash barrels. A properly operated and located compost pile does not have an unpleasant smell. Your county agricultural agent can tell you how to make a proper compost (see For further information section).

It is important to remember that composting is simply the natural process of decay whereby decomposing organisms break down organic wastes, freeing the elements and nutrients to reenter the life cycle as they are taken up by new individuals. When we form our own compost we are simply trying to enhance the natural process. New York State's Principle Fish and

Wildlife Biologist Anthony Taormina in an article in The Conservationist (see For further information section) gives these tips: The smaller the better, shredding helps; the warmer the better, 150 degrees Fahrenheit is ideal; compostables should be damp but not soggy; make oxygen available through mixing and loosening.

The United Nations World Health Organization has published the best review of the subject of commerical composting, Composting, Sanitary Disposal and Reclamation of Organic Wastes by Harold B. Gotaas.

For further information

Books

1. NOT SO RICH AS YOU THINK by George R. Stewart; Signet-New American Library, 1967, 95¢. All aspects of the waste-garbage-trash-junk-litter problem.
2. CLEANING OUR ENVIRONMENT: The Chemical Basis for Action; The American Chemical Society, Washington, D.C., 1969. Good factual information.
3. SOLID WASTES, a collection of reprints from the magazine ENVIRONMENTAL SCIENCE AND TECHNOLOGY. American Chemical Society, $2. A good overview of recycling problems and solutions.
4. USER'S GUIDE TO THE PROTECTION OF THE ENVIRONMENT; Friends of the Earth/ Ballantine, 1970, $1.25. A list of what to — and what not to — buy to help the environment.
5. THE AFFLUENT SOCIETY by John Kenneth Galbraith; Mentor, 95¢. A critical analysis of a consumer society.

Publications

1. COMPOSTING OF MUNICIPAL SOLID WASTES IN THE UNITED STATES by A. W. Breidenbach, et al., U.S. Environmental Protection Agency Publication, 1971, Washington, D.C.
2. WASTES IN RELATION TO AGRICULTURE AND FORESTRY by Cecil H. Wadleigh, U.S. Department of Agriculture, Miscellaneous Publication No. 1065, March 1968. U.S. Government Printing Office, Washington, D.C. 60¢.

3. HELP. Department of Environmental Conservation, 50 Wolf Rd., Albany, N.Y. 12201. Useful do's and don'ts.

Articles

1. "Bottles, Cans, Energy" by Bruce M. Hannon, ENVIRONMENT, March 1972. An excellent critique of the solid waste crisis.
2. "Solid Waste Treatment Technology" by Alex Hershaft, ENVIRONMENTAL SCIENCE AND TECHNOLOGY, May 1972.
3. "What To Do With Waste? Use It Over and Over and Over Again" by LaMont C. Cole, NEW YORK TIMES MAGAZINE, April 2, 1972. An excellent article on waste and recycling.
4. "Renewing the Soil" by Judith G. Meyer, ENVIRONMENT, March 1972. This article on composting lists all the municipal composting plants in the United States. The article is based in large part on the following paper.
5. "The Potential of Composting in Resource Recovery" by Charles Gunnerson, presented at the 137th Annual Meeting of the American Association for the Advancement of Science, Chicago, December 1970.
6. "The Art and Science of Composting" by Anthony S. Taormina, THE CONSERVATIONIST, October-November 1971. For those who want to build a compost.
7. "Composting Municipal Solid Wastes," ENVIRONMENTAL SCIENCE AND TECHNOLOGY, November 1971.
8. "Waste Recycling Effort Found to Lag" by Robert A. Wright, THE NEW YORK TIMES, May 7, 1972.
9. "Animal Polluters," TIME Magazine, September 14, 1970. On agricultural waste.
10. "The Fusion Torch. Closing the Cycle from Use to Reuse" by Bernard J. Eastlund and William C. Gough, Division of Research, U.S. Atomic Energy Commission, May 15, 1969. U.S. Government Printing Office.

Films*

1. THE GARBAGE EXPLOSION, 16 min., color or b&w, Encyclopedia Britannica Educational Corporation, Florida State University, rental $9, grades 4-12. Presents problems, analyzes present disposal methods, explores some long-range solutions.

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* Addresses of film distributors are given at the end of this guide.

2. UP TO OUR NECKS, 25 min., color, NBC, Florida State University, Mass Media Ministries. NBC-TV production explores gigantic waste problem and some alternative solutions now available.

3. GARBAGE, 10 min., color, King Screen Productions, $135, rental $15, grades 1-12. Presents all aspects of the waste problem, but no solutions.

4. OUR POISONED WORLD -- GARBAGE, NOISE, HEAT, 30 min., Time-Life Films, $350, rental $30, grades 7-adult. A good introduction to title subjects.

Organizations

1. County Agricultural Agent
U.S. Department of Agriculture
Cooperative Extension Service
(See U.S. Government in telephone directory for your county) For information on building a compost.

2. Solid Waste Management Office
Environmental Protection Agency
1626 K St.
Washington, D.C. 20460

3. Environmental Protection Administration
2358 Municipal Bldg.
New York, N.Y. 10007
It runs the Sanitation Department and Department of Water Resources -- for information on municipal sewage or garbage treatment.

4. Office of Recovery, Recycling and Reuse
Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201
For information on collection and recycling programs.

5. New York State Environmental Facilities Corporation
50 Wolf Rd.
Albany, N.Y. 12201
It is designing advanced systems of waste recycling.

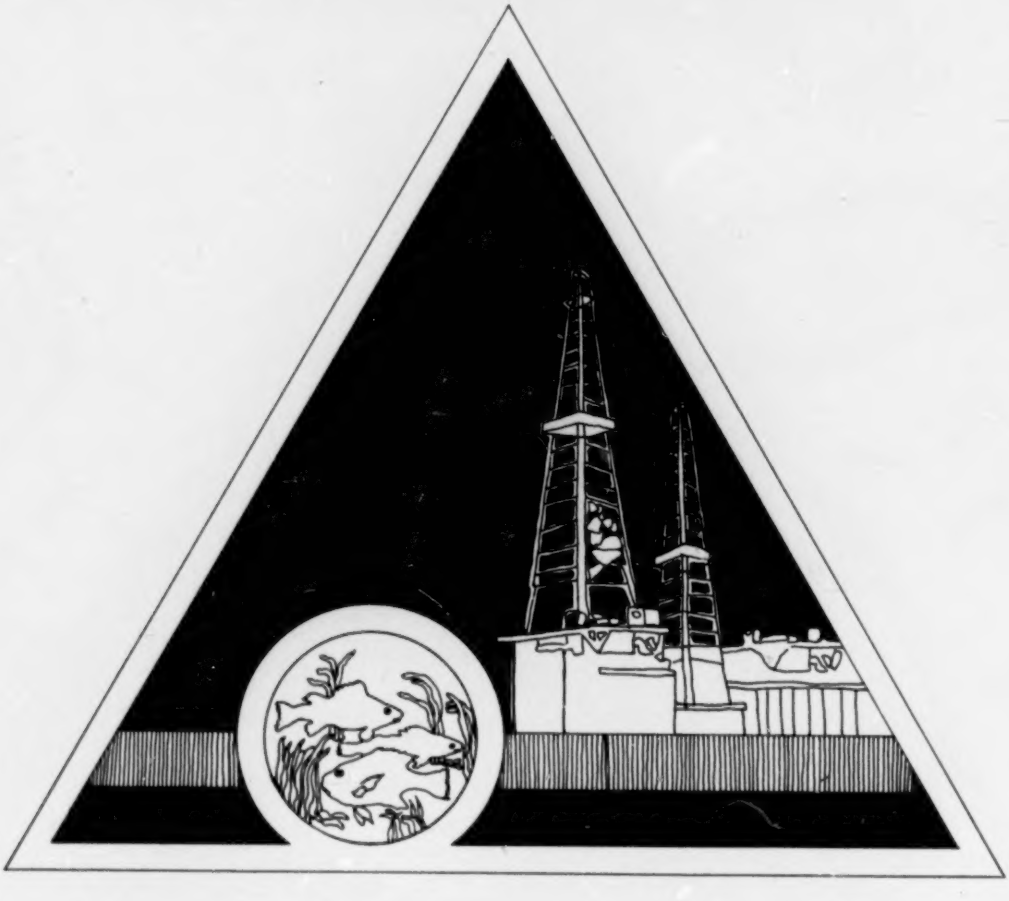
6. CONCERN, Inc.
2100 M St.
Washington, D.C. 20037
It publishes ECO-TIPS to guide consumers in environmentally sensible purchases at the supermarket.

7. Reynolds Aluminum and Coca Cola run recycling operations.
Check your local area.

8. Ecology, Inc.
221 Varick Ave.
Brooklyn, N.Y. 11237

This company runs a professional refuse composting operation.

SIX
FATHOMS DEEP



SIX FATHOMS DEEP

Perspective

United Nations agencies divide marine pollution into five categories:

1. Disposal of domestic sewage, industrial and agricultural wastes
2. Discharge of shipborne pollutants
3. Interference with the marine environment from exploration and exploitation of marine minerals
4. Disposal of radioactive wastes from peaceful uses of nuclear energy
5. Military uses of the ocean

Of the five categories, the disposal of sewage, industrial and agricultural wastes is considered the most serious, but the pollution from oil is probably the most widespread.

Explorer Thor Heyerdahl reported on the basis of two expeditions that the North Atlantic surface current moving constantly from Northwest Africa to the Caribbean Sea is polluted by a continuity of drifting oil clots. He said that observations from the papyrus vessel Ra II showed that 2,400 miles of open ocean were contaminated with oil.

The Torrey Canyon and Santa Barbara oil spills were crucial events in the general awakening to the environmental crisis. (The Federal Government has collected $5 billion from leasing 7.2 million acres of the continental shelf for oil development and there are 16,000 oil wells off the shores of the United States alone.) Those events epitomize a central dilemma of our time. We have an insatiable appetite for energy, but now we want a clean environment, too. Can we have both?

Water, principally oceans, covers 70 percent of the earth's surface, but this covering is quite thin compared to the bulk of the globe as a whole. The oceans are far from a bottomless sewer that can absorb endless contaminants. With thousands of chemicals entering the oceanic waters, French undersea explorer Jacques Cousteau told a United Nations symposium that in the past 20 years the vitality of the seas in terms of fish and plant life has declined by 30 to 50 percent. Swiss marine explorer Jacques Piccard warned before the same body that if nothing is done, all the oceans will be dead before the end of the century. Other scientists dispute the former estimate, questioning the basis for such a comprehensive statement, and wonder at the sweeping prediction of Piccard. Far too little is known, they say, for such judgments. At the same time, they urge caution in what we put into the oceans for the very reason that so little is known and therefore we cannot know for sure what we are doing to these great bodies of water.

Piccard estimates that from 5 to 10 million tons of oil pollution are going into the seas every year. Some 1.8 million tons, he says, come from auto exhaust emissions which rise into the atmosphere and then precipitate onto the oceans' surface. One million tons come from tanker spills. As the broadcast documents, more than half of the oceangoing cargoes now are oil. The rest of the petroleum is fed into the oceans from the world's polluted rivers.

At the same time, civilization grows ever more dependent upon energy and upon oil in particular as a source of that energy. In 1971, petroleum supplied 44 percent of the energy needs of the United States, which uses one-third of all the power produced in the world. In 1971, the United States consumed more than five and a half billion barrels of oil, an increase of 3 percent over 1970; but the most significant increase for the United States was in imported oil -- up more than 25 percent over 1970. Western Europe and Japan, the other great industrialized areas, import all their oil. Any sudden stoppage of oil supplies for any of these areas would be catastrophic.

Yet the burning of fossil fuels -- petroleum, in particular -- is a temporary phenomenon in human affairs. We are consuming petroleum at such a rate that the bulk of the world supply probably will be exhausted in a century or less. Many experts believe that this petroleum would be even more valuable to humans for its chemical qualities than for its energy component.

This perspective inevitably focuses on questions of morality. Do we have the right to consume this resource, which took eons to create, at such a rate? When X fraction of the energy is used for trivial ends? When its use compromises the integrity of the biosphere? Should some oil be conserved for our children's children and their children after them? Does posterity have any rights? Do we really know what we are doing?

The Broadcast: SIX FATHOMS DEEP

SIX FATHOMS DEEP recounts several major oil spills and some constructive responses to them. In January 1971, two oil tankers collided in San Francisco Bay, spilling nearly 1 million gallons of fuel oil. Many volunteers -- including a great number of young people, but also business executives, hard hats, families -- began a round-the-clock cleanup campaign. An oil industry antipollution cooperative supplied ships, supplies, and equipment. Unfortunately, the combined efforts were unable to save most oil-soaked birds.

As a result of the massive oil well blowout off Santa Barbara, California, in January-February 1969, concerned citizens organized GOO, for Get Oil Out. While the relatively small group of Santa Barbara citizens hasn't lived up to its name, a spokesman points out that only one new platform has appeared in the channel since the blowout and adds, "I do believe that if we can keep the group from becoming apathetic, which is exactly what the oil companies and the government hope we will do, that we can win the battle."

The Torrey Canyon incident off England's Cornwall coast in 1967 signaled the first widespread alarm over oil pollution...and in fact was a key event in awakening general concern of the threat to the human environment.

New rules and regulations now under consideration by a United Nations agency which deals with seafaring matters indicates how far attitudes have changed since Torrey Canyon. The Inter-Governmental Maritime Consultative Organization intends to prohibit all intentional discharge of oil into the sea. However, the organization believes it may take until the middle or end of the decade before there will be international agreement on such a convention. IMCO also proposes that oil companies be responsible financially for cleaning up oil spills in international waters. An IMCO spokesman says the time is approaching when a ship's captain no longer will have complete freedom in choosing routes, but will have to follow instructions of a ground controller, just as an airlines pilot does now.

Controlling oil pollution is becoming an ever more difficult task. More than half of the world's sea trade now is in oil, some 600 million tons a year. The figure keeps growing. Tankers now the length of three football fields and capable of carrying 300 thousand tons of oil conceivably may be followed by tankers carrying 1 million tons of that cargo. Even though these sizes suggest possibilities of frightful spills, most pollution today comes from routine flushing of ballast tanks. A new technology is providing one effective solution to this practice -- that is, to allow the residual oil in the tanks to rise to the top, then flush out the seawater. However, all tankers are not equipped to carry out this procedure.

Recent studies by Max Blumer of the Oceanographic Institution at Woods Hole, Massachusetts, show that oil persists in the ocean environment for periods longer than had been thought previously. Biochemist David Harrison showed why much of the ocean's oil pollution may not be visible -- because it is absorbed by sand and other sediments and sinks to the ocean floor.

Controversy in Maine over whether to build a deepwater port for oil tankers epitomizes the controversy and dilemma over oil: oil production confers great economic benefits, but is becoming ever more damaging to the environment. Maine industrialist Robert Monks believes we can have the benefits without the damage by putting industry on notice that the public will not accept anything less.

What can I do?

There is only one reason why bigger and bigger tankers are being built: economics -- to cut costs, to increase profits. No other consideration, including bigger and bigger risks to the marine environment, seems to matter.[1] An Inter-Governmental Maritime Consultative Organization conference in 1973 is attempting to reduce some of the risk by requiring these huge

[1] The Torrey Canyon was a 120,000 ton "supertanker." Now, nearly 200 tankers of 200,000-ton capacity are being built, and eleven 300,000 ton vessels.

tankers to have double bottoms (in case of collision) and two tanks (so that the entire cargo would not be lost).

If you believe that building ever bigger tankers is playing Russian roulette with the oceans, you can at least express your concern to:

Director
Inter-Governmental Maritime Consultative Organization
London, England

Chairman
Merchant Marine and Fisheries Committee
Suite 1334
House of Representatives
Washington, D.C. 20515

Chairman
Commerce Committee
Suite 5202
Senate
Washington, D.C. 20510

The question of marine pollution and jurisdiction was a matter of top priority for the permanent organization following up the work of the United Nations Conference on the Human Environment in Stockholm in June 1972.

A basic question is posed by the foregoing considerations. Should the economic factor be the only one or even overriding in our decisions, particularly where environmental impact is involved? Who is saving, who is profiting, if the oceans become irremediably contaminated?

While the subject of global oil pollution is enormous and beyond the individual's reach, there are many important things the individual can do. As industrialist Monks suggested in the broadcast, fishermen and ocean bathers can report oil slicks to the U.S. Coast Guard. It is that service's responsibility to track down offenders in U.S. waters. Offenders must pay the costs of cleaning up. If you discover oil pollution occurring in any navigable U.S. waterway and can connect it to its source, report both to the nearest U.S. Attorney's office with proof — facts, photographs, water samples. For such information you are entitled to half of whatever fine is levied after successful prosecution of the polluter (see FLOW GENTLY).

Beyond this, there is a correlation between the ever growing use of gasoline and electricity (much of it produced by burning oil) and tankers crisscrossing the oceans. How many people who came to save the oil-soaked birds arrived at the beaches in high-powered cars?

Individuals, together, can make a difference. These are some of the questions you can ask, and answer, yourself: Can our family get along with one car rather than two? Can we survive with a car with less horsepower than our present one? Is this trip necessary? Can I ride a bicycle rather than drive my car? Can I walk? Do we really need a power mower or could we get by with a hand mower? Wouldn't a bicycle do instead of a minibike, a sled or skis rather than a snowmobile, a sailboat instead of a power boat? Wouldn't we be just as happy without electric carving knives, pencil sharpeners, can openers, and toothbrushes? Is the TV set on when nobody is in the room? Is the air conditioner on full when it could be on low? Did you know that throwaway bottles, aluminum cans, synthetic fibers consume more electricity than returnable bottles, iron-tin cans, wool, and cotton? How much are you willing to give up for a clean environment? The question may become: how much will we have to give up?

The electric pencil sharpeners and electric toothbrushes use modest amounts of electricity, true, but they symbolize our disregard for energy. What is the cost of a light burning? some people ask, and answer, a penny an hour. A trifle. Well, they're wrong. The cost is precious, irreplaceable oil. The price is an ever growing stain upon our oceans. And on that scale, no one yet has calculated the bill.

For further information

(See ALL THE FISH IN THE SEA for additional information on oceans)

Books

1. THE FRAIL OCEAN by Wesley Marx; Sierra Club/Ballantine, N.Y., 1969, 95¢. On what is being done, harmfully, to the oceans.
2. OILSPILL by Wesley Marx; Sierra Club, San Francisco, 1971, $2.75.
3. OIL AND WATER: The Torrey Canyon Disaster by Edward Cowan; Lippincott, N.Y., 1968, $6.95.
4. THE MAGIC OF WALKING by Aaron Sussman and Ruth Goode; Simon and Schuster, N.Y., 1967, $7.50. A complete guide to the joys of walking.
5. THE LIFE OF THE OCEAN by N. J. Berrill; McGraw-Hill, N.Y., 1966, $4.95. Good simple, well-illustrated account of ecology of oceans and their relation to man.
6. THE LIFE OF THE SEASHORE by William H. Amos, McGraw-Hill, N.Y., 1966, $4.95. Ties ecology of shores to oceans and to man.

Publications

1. THE SEA. PREVENTION AND CONTROL OF MARINE POLLUTION, United Nations Economic and Social Council Report E/5003, May 7, 1971. A comprehensive treatment of ocean pollution.
2. THE OIL SPILL PROBLEM, First Report of the President's Panel on Oil Spills, Office of Science and Technology. U.S. Government Printing Office. 35¢.
3. OIL POLLUTION, Report to the President by the Secretary of the Interior and the Secretary of Transportation, February 1968.

Articles

1. "Oil, Be Seeing You in All the Old Familiar Places" by Wesley Marx, SIERRA CLUB BULLETIN, September 1971. A good summary of facts and figures.
2. "The Oceans: World Sump" by Joel Hedgpeth, ENVIRONMENT, April 1970.

3. "Our Oceans Are Dying" by Jacques Cousteau, THE NEW YORK TIMES, November 14, 1971. Excerpts from testimony before the Senate subcommittee on oceans and atmosphere.

4. "We Are Killing The Sea Around Us" by Michael Harwood, THE NEW YORK TIMES MAGAZINE, October 24, 1971. On sewage, industrial wastes, and oil threatening the chemistry and vital food chains of the world's oceans.

5. "The Dirty Dilemma of Oil Spills," LIFE Magazine, March 6, 1970.

6. "Santa Barbarans Cite an 11th Commandment: 'Thou Shalt Not Abuse the Earth'" by Ross MacDonald and Robert Easton, NEW YORK TIMES MAGAZINE, October 12, 1969.

7. "Slick Off California Coast Revives Oil Deal Disputes" by Gladwin Hill, THE NEW YORK TIMES, February 2, 1972. The beginning of the Santa Barbara story.

8. "Santa Barbara, 2 Years After Its Oil Well Blowout, Still Hopes to Curb Offshore Drilling," by Gladwin Hill, THE NEW YORK TIMES, January 27, 1971.

9. "The Santa Barbara Oil Blowout and Its Aftermath -- Environmental Litigation" by Joyce P. Davis, Fordham Law School, January 15, 1971. Copy at Natural Resources Defense Council, 36 West 44th St., New York, N.Y.

10. "Tankers' Oil Spillage on Planned Alaska Route Is Estimated at 392 Barrels a Day" by William M. Blair, THE NEW YORK TIMES, February 24, 1972.

11. "Trans-Alaska Pipeline: Impact Study Receives Bad Reviews" by Robert Gillette, SCIENCE, March 19, 1971.

12. "Who Needs the Alaska Pipeline" by David Brower, THE NEW YORK TIMES, February 5, 1971. The statement of a leading conservationist.

Films*

1. SANTA BARBARA -- EVERYBODY'S MISTAKE, 30 min., color, Indiana University, $315, rental $11.50. Examines the whole oil spill episode, posing question why society places such a high need on oil that it willingly endangers its own life.

2. TORREY CANYON, 26 min., Time-Life Films, $200, rental $20, grades 7-adult. A film of the Torrey Canyon disaster, the giant oil spill off England.

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* Addresses of film distributors are given at the end of this guide.

Organizations

1. Conference on the Human Environment
   United Nations, N.Y. 10017

2. Inter-Governmental Maritime Consultative Organization
   101 Piccadilly
   London, England

3. Committee for the Peaceful Uses of the Seabed and Ocean Floor
   United Nations, N.Y. 10017

4. Marine Sciences Research Center
   State University of New York
   Stony Brook, L.I., N.Y. 11790

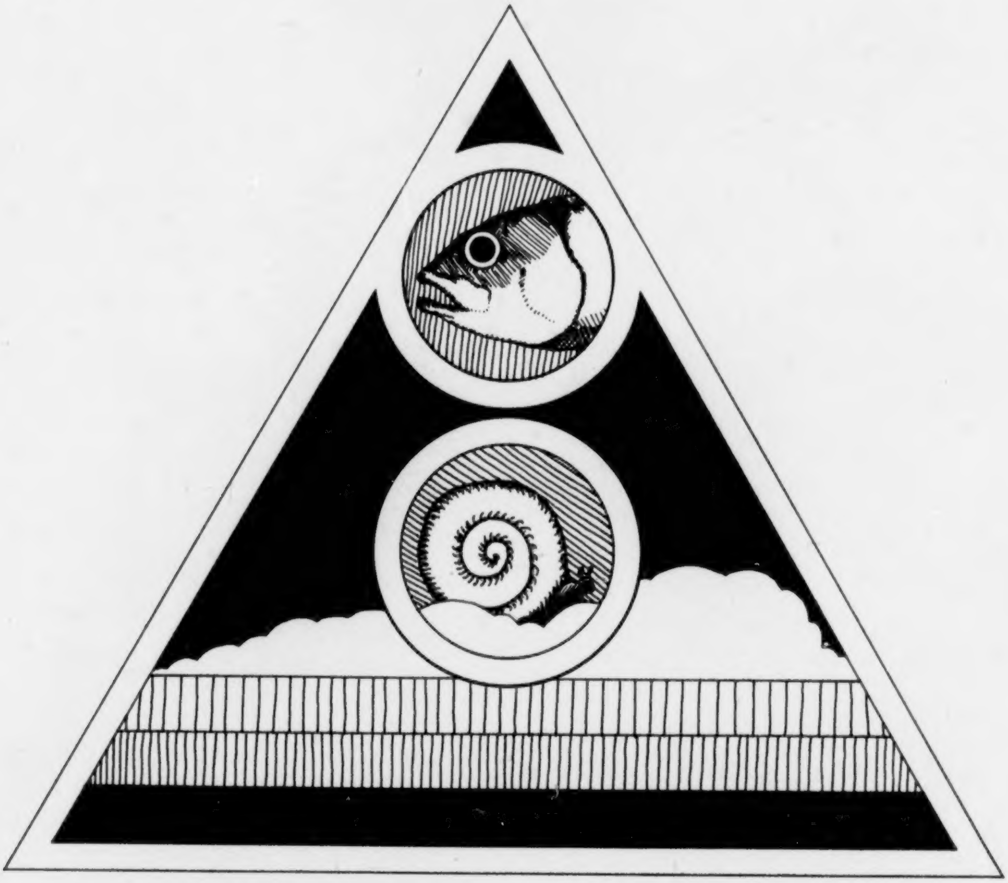
5. American Petroleum Institute
   1801 K St., NW
   Washington, D.C. 20006

6. Merchant Marine and Fisheries Subcommittee on Oceanography
   U.S. House of Representatives
   Washington, D.C. 20515

7. Subcommittee on Oceans and Atmosphere
   U.S. Senate
   Washington, D.C. 20510

8. Commerce Committee
   Suite 5202
   U.S. Senate
   Washington, D.C. 20510

FLOW GENTLY



121/122

Perspective

If you want to know how well or badly off a state or nation is environmentally, there probably is no better indicator than the condition of its waterways. The effort to clean up inland waters in the United States has been going on since 1948, when the first Federal legislation was enacted, with no sign of overall progress. Indeed, the situation is so confused and the information so inadequate that experts are hardpressed to tell whether water pollution is getting worse or better.[1]

There have been bright spots. The four-state (New York, Pennsylvania, New Jersey, and Delaware) Delaware River Basin Commission has become a model for efforts to upgrade a river. Vigorous action under United States Attorney Witney North Seymour, Jr., in enforcing the Refuse Act of 1899 has curbed some of the pollution flowing into the Hudson River. Data being collected with permit applications submitted by some 20,000 industrial firms are giving authorities a better understanding of the pollution problem.

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[1] The second annual report, Environmental Quality, published by the Council on Environmental Quality in August 1971 states: "Although the BOD (for Biochemical Oxygen Demand, one form of measurement of water pollution) level of wastes actually discharged has remained roughly constant in recent years, the overall quality of the Nation's waters probably has deteriorated because of accelerated eutrophication, increased discharges of toxic materials, greater loads of sediment, and other factors. The increase in these pollutants has been generated by greater use of phosphates in laundry detergents, pesticides and fertilizers in agriculture, chemicals and metals in industrial processes, and increased construction. The Environmental Protection Agency estimates that almost one-third of U.S. stream-miles are characteristically polluted, in the sense that they violate Federal water quality criteria. Less than 10 percent of U.S. watersheds were characterized by EPA regional offices as unpolluted or even moderately polluted. However, these estimates are quite subjective and are not based on actual monitoring data."

On the other hand, the Refuse Act -- an extremely effective anti-pollution statute and vehicle for direct citizen action -- is threatened (at this writing) with repeal or being bypassed by new legislation, reducing direct citizen involvement. The regulatory situation grows more confused. With the growth of the industrial economy and the human population, so grows the pollution burden.

The difficulty in making progress against water pollution is understandable, and is the reason why this sector makes an accurate indicator of national will. Great sums of money are involved. In the public sector, municipalities, states, and the Federal Government must appropriate billions of dollars for all the sewage treatment plants required to clean the flow of municipal wastes. This money comes from the taxpayer. In the private sector, it becomes an additional expense when a business that has been dumping its effluent wastes into the environment free of charge suddenly must be responsible for the discharge. It costs to change an operation and to install new equipment; ditto for agricultural wastes. Just as the public expense gets back to the taxpayer, so additional business costs are borne by the consumer.

It becomes a question of how much clean water -- and to what degree clean -- are we, the people, willing to buy (and how effective we are in seeing that our elected officials carry out our wishes and see that we get what we pay for). Up to a point. Beyond that point, it becomes a matter of survival -- when drinking water supplies become contaminated, ground water systems tainted or depleted, and clean water needed for industrial production disappears because of overdemand. A recent, extensive Federal survey revealed that 30 percent of the community water supply samples taken had excessive amounts of harmful germs and chemicals. The ground water in the Boston area is so contaminated with salt from highway deicing that it is no longer safe for persons on a salt-free diet to drink.

From the Old Mill Stream (the Blanchard River in Ohio) to the Father of Waters, the great Mississippi, and virtually every major river basin in between, America's waterways are polluted. The Mississippi now is so filthy that it may be threatening aquatic life in the Gulf of Mexico and human health in southern Louisiana.

The United States is not distinctive. Any nation that has profited from the Industrial Revolution has incurred this environmental penalty. From the Volga to the Rhine and Seine and Thames, from the Baltic Sea to the Mediterranean, water pollution plagues the industrialized societies of the western world. In the underdeveloped countries of Asia, the Middle East, and Africa, the situation is even worse. In these areas, the same river which carries off human wastes also supplies the drinking water. "A large part of the world lacks a safe water supply," said Callis Atkins, director of the United Nations World Health Organization's environmental health division. A safe water supply, he said, would prevent the spread of cholera, typhoid, and other dysenteries which are caused by contamination from human wastes.

Obviously, a body of water can be contaminated or degraded in different ways. Probably the oldest way is through sedimentation washing into streams. Billions of tons of topsoil are lost from the land masses through this process each year, but the process is accelerated wherever there is erosion, irrigation, and disturbance of land through strip mining.

The disposal of human wastes certainly goes back into prehistory as well; but the problem was aggravated, first, by the tremendous growth and concentration of human settlements and second, by the widespread adoption in this century of the flush toilet. It has been estimated that each American contributes 135 gallons of sewage daily (almost all of it is clean water that is contaminated by a minute percentage of waste). Four thousand gallons of water are needed in order to purify or dilute each individual's daily sewage. At this rate, the entire river flow of the United States would self-purify the sewage of no more than 250 million people.

Domestic waste, as it is called, not only puts harmful germs into the water, but also uses up dissolved oxygen. Fish and other aquatic life, of course, need that oxygen in order to live. Thoroughly oxygenated water carries about 10 parts of oxygen per million parts of water, but 5 ppm (parts per million) is sufficient to support most aquatic life. If the sewage overloads a river at a certain point, reducing its dissolved oxygen to 3.2 or zero ppm, then no fish nor many other life forms can survive in that section.

On the other hand, sewage usually contains high concentrations of phosphates and nitrates, substances that are fertilizers for farmlands. These nutrients, naturally, encourage water plants to grow; but they may be unwanted plants, such as certain kinds of algae, or the luxuriance of plant growth consumes great amounts of dissolved oxygen, again depriving other aquatic life of their essential oxygen supply. Once fishes and accompanying animals disappear, the ecology of the water body changes for the worse. The "enrichment" of a lake or river with these nutrients is known as eutrophication. In many respects, it is like aging, so that a eutrophic lake may be thought of as old and infirm. A limnologist, Arthur Hasler of the University of Wisconsin at Madison, estimates that one-third of the 100,000 lakes in the United States are subject to eutrophication because of the substances people have been putting into them. Runoff of fertilizers from farmlands has contributed importantly to this widespread eutrophication; so have phosphate detergents, and a number of communities and states have taken action to ban or limit phosphates in detergents.

Another broad category of water pollution is chemical, the toxic effluents from industrial plants. In terms of demand upon dissolved oxygen, industrial wastes in the United States are three times as great as domestic wastes. Agricultural wastes -- manure from cattle, sedimentary runoff, and residues from chemical fertilizers -- are still another huge contributor to water pollution.

A report by a group of ecologists, Man in the Living Environment, states that known potential supplies of phosphorous, an element essential for life, will be exhausted before the end of the 21st century.

Still another form of pollution is invisible, but tangible nevertheless. That is thermal pollution, increasing the waterway's normal temperature with the waste heat from power plants. And there is oil pollution from commerce. Hudson River shad, once a culinary delight, are no longer marketable because of their oily taste. Water bodies also pick up a considerable amount of lead and other contaminants from gasoline fumes.

It could well be that the cost of clean waters is nothing less than changing how we live: putting the goal of pure waters higher on our list of priorities than we have so far indicated we are willing to do.

The Broadcast: FLOW GENTLY

This is the story of pollution of inland waterways -- rivers, lakes, wetlands -- and the problem involved, what can be done about it and what is being done about it.

In one instance, we see the predicament of a city that wishes to clean up the industrial and human wastes it pours into a nearby river. Costs escalate with the degree of cleansed city waste fluid returned to the river. Primary sewage treatment removes only solids. Secondary treatment separates about 90 percent of the toxic material into a sludge which must be disposed of elsewhere; however, the remaining fluid going back into the river still contains substantial amounts of nitrates and phosphates which cause excessive plant growth and thus induce eutrophication in the river. Tertiary treatment, the ideal, puts clean water back into the river -- but costs are prohibitive.

Even for the lesser degrees of purification, the expenses are such that the individual city, impoverished by so many other demands for services cannot go ahead on its own resources. It must rely on state and Federal funds to pay for the greatest part of the project. As for Federal funding over recent years, performance has lagged far behind promises.

A newly discovered threat may jog lawmakers and authorities into taking more expeditious action. For the first time, viruses have been isolated in a drinking water supply. The viruses are believed to have migrated from tainted effluents through the ground water system into the drinking water.

We see the polluted Buffalo river at Buffalo, N.Y., perhaps the most heavily polluted in the United States. Stanley Spisiak, a conservationist who has observed this pollution for years, discusses the situation.

Nearby Lake Erie has been subjected to most of the ills which an industrialized society can visit on a waterway -- eutrophication, heavy sewage pollution, plus industrial poisons like mercury.

Mercury pollution is a chapter in itself. Sweden was the first nation to become alerted to this particularly hazardous form of water contamination. Swedish lakes, it was discovered when scientists deliberately began probing, registered high mercury levels caused by paper and other industrial plants. Sweden imposed severe restrictions on dumping mercury, closed many of its lakes to recreation, and embarked on what could be a century-long cleanup campaign. It may take that long for the mercury to be purged from the biological-sedimentary-aqueous environment. Canada and the United States now have committed themselves to reducing the mercury content as part of their cleanup of the Great Lakes.

Robert Boyle, author of The Hudson River, assesses the national water pollution situation.

Water pollution has been a trademark of the industrialized nations of Europe. The heavily used Rhine rises crystal pure in the Swiss Alps and descends past France through West Germany and Holland to empty its four contents into the North Sea. Once the fabled habitat of Rhine maidens, now fish have difficulty surviving in the industrial artery. In contrast, the Ruhr has been managed in a much more exemplary manner, with industrial wastes controlled, with companies charged according to how much effluent they discharge into the river. The Ruhr is a shining example that it can be done.

The Vistula River in Poland is another kind of example -- where people are trying to do it. The Vistula is a challenge. The river is badly polluted, but a cleanup campaign is underway, and so this story does not yet have an ending.

The Indus River in India presents another kind of pollution problem -- contamination from human sewage, a problem which plagues many underdeveloped countries that must rely on their river for drinking water among other things.

There is another way in which inland waters are affected by man.

The building of dams can create great manmade lakes, good for fishing and recreation and for the controlled supply of water for irrigation, but these impoundments can have untoward repercussions as well. Dams can cut off the flow of rich nutrients which make so many of the world's great river valleys fertile cradles of civilization. At the same time, siltation backs up behind a dam, eventually reducing its usefulness. Lands that are not irrigated carefully can become too salty as minerals percolate upward into the topsoil. At the end of this process, the soil can become too toxic to support agriculture.

The most important health hazard is that the softly flowing waters of dammed rivers and irrigation canals are well suited for snails that are carriers of schistosomiasis in tropical areas, a debilitating disease that has shortened the lives of hundreds of millions of Africans and Asians.

What can I do?

Don't take clean water for granted. Along with breathable air, it is the most precious resource we have.

Other actions would follow from that one basic evaluation. They all add up to conservative use of water: not letting the water run continuously when washing hair or dishes or brushing teeth; fixing leaks, flushing toilets sparingly, putting a brick or two in the toilet tank to reduce water per flush. The flush toilet or water closet has been in general use for less than a century. Today, with water becoming an ever more precious commodity, our whole method of sewage disposal needs rethinking. The water serves mainly as a means of conveyance to move human wastes and secondarily as a substance for dilution. This is a wasteful use for our water and soon we may not be able to afford it. One possible substitute might be the inclusion of an individual sump in each new house or apartment to collect the human wastes. The contents would be removed periodically and since they would not be mixed with chemicals, heavy metals, and other toxic materials, the substance could be used for fertilizer.

Do not use the toilet as a trash basket. Do not use colored or bleached household papers -- facial tissues, paper towels, toilet paper; the dye and bleach pollute water and soil. Perhaps even more importantly, a boycott of these items would discourage the use of dyes in manufacturing plants where discharges have polluted adjacent waterways.

Do not use detergents with phosphate. Baking soda and a non-chemical scouring pad are good cleaning agents. Adding one-third of a cup of washing soda to about one and a half cups of laundry soap will clean moderately soiled clothes in soft water. In hard water, add one quarter cup of washing soda to the first rinse. For best results with ordinary stains, presoak in cool or warm water for 5 to 20 minutes. Beware of commercially packaged water softeners; their phosphate content often runs as high as 85 percent.

Support legislative and governmental measures to improve sewage treatment plants. Support new sanitary engineering research. Follow the actions of your representatives, legislature, administration, closely (of course, this applies to all matters of concern to you). It is not unusual for a legislature to authorize a handsome amount of funds for a project and then when many voters have lost interest or been distracted by other events to appropriate a much smaller amount. Even when a legislature does appropriate adequate funding, the executive branch may choose not to spend it. One price for environmental improvement, to paraphrase an old adage, is eternal vigilance.

The reason this is necessary is that it seems to be in the immediate, short term advantage of many special and/or business interests not to change the status quo. Public officials need constant, vocal public support in order to press and carry out economically unpalatable reforms. The uninitiated citizen must understand that lobbying represents an enormous countervailing force to public wishes expressed through elections, referendums, attending meetings, writing letters, and so forth. Lobbying is a perfectly legal and proper activity and is practiced by all organized groups that seek laws favorable to their interests, but its arena is behind the scenes and accounts for the fact that elected representatives do not always take actions consistent with the broad public interest.

The Refuse Act of 1899 is probably the best instrument a citizen ever had to take direct action against polluters. In essence, this law says that if a citizen observes industrial pollution of any navigable waterway, he can inform his nearest United States Attorney and if the polluter is convicted and fined, the citizen will be awarded half the fine. Fines range from $500 to $2,500 per offense, and each day could count as a new offense. One woman in New York City was awarded $12,500 for reporting a concrete company that dumped its wastes into the East River.

Now in order to win a conviction, certain information is needed: a statement, preferably notarized, setting forth the nature of the refuse material discharged; the source and method of discharge; the location, name, and address of the company or persons causing the discharge; the name of the waterway; each date on which the discharge was observed; names of other witnesses; provide photographs of the pollution; collect the polluted water in a clean jar and seal it. If there is a university or other chemical laboratory nearby, have the contents analyzed; if not, present the jar along with the other evidence.

Now in certain cases, polluters obtain permits to pollute from the U.S. Army Corps of Engineers and are not liable to lawsuit under the Refuse Act. Water pollution regulations are in the process of change whereby all industrial polluters must file for these permits, and so direct citizen action is being phased out. An advantage of this change is that all polluters will be codified and subject to systematic remedial action, but the citizen still has to act as a watchdog of the state agency responsible for enforcement and complain to the regional Environmental Protection Agency administrator when there is no action. The citizen can also act through local watchdog groups such as the Hudson River Fisherman's Association, the Hudson River Sloop, or a chapter of the Sierra Club.

Natural Resources Defense Council in New York City is monitoring the entire water pollution regulatory process and is a good source through which to keep abreast of the current situation.

For further information

Books

1. WATER POLLUTION by Charles W. Lavaroni and Patrick A. O'Donnell; Addison-Wesley, 1971, $1.68. For students (grades 7-9); with experiments. Teachers' edition also good.
2. THIS VITAL AIR, THIS VITAL WATER by Thomas Aylesworth; Rand McNally, Chicago, 1968, $4.95. An easy introduction to the subject.
3. CLEANING OUR ENVIRONMENT: The Chemical Basis for Action. American Chemical Society, Washington, D.C., 1969, $2.75. Good factual material on water pollution.
4. WATER WASTELAND; A Nader group report directed by David R. Zwick, 1971. An indictment of the Federal Government's inability to control industrial pollution.

5. THE WATER LORDS by James M. Fallows; Grossman, N.Y., 1971, $7.95. A Nader group report on industry and environmental crisis in Savannah, Georgia.

6. DISASTER BY DEFAULT by Frank Graham, Jr.; Curtiss, 1966, 75¢. Emphasizes that public apathy by the individual is a major cause of the ineffective cleanup of water.

7. THE HUDSON RIVER by Robert Boyle; Norton, N.Y., 1969. A natural and unnatural history of the river by a man who knows it exceptionally well.

8. LIFE AND DEATH OF THE SALT MARSH by John and Mildred Teal; Audubon/ Ballantine, N.Y., 1969, $1.25.

9. YOUR ENVIRONMENT AND WHAT YOU CAN DO ABOUT IT by Richard Saltonstall, Jr.; Walker, N.Y., 1970, $6.95. Contains a primer on water pollution and quality.

10. THE POLITICS OF POLLUTION by J. C. Davie; Pegasus, 1970, $6. A good review of the Federal legislative process to achieve water pollution laws.

11. MAN IN THE LIVING ENVIRONMENT. The National Institute of Ecology; University of Wisconsin Press, Madison, 1971.

12. CHEMICAL FALLOUT edited by Morton W. Miller and George G. Berg; Charles C. Thomas, Springfield, Ill., 1969, $22.50. Reports on mercury pollution in Sweden.

13. EUTROPHICATION: CAUSES, CONSEQUENCES, CORRECTIVES. National Academy of Sciences, 2101 Constitution Ave., Washington, D.C. 20418. Definitive scientific reports on various aspects of the subject, but heavy going.

14. THE LIFE OF RIVERS AND STREAMS by R. L. Usinger; McGraw-Hill, N.Y., 1967, $4.95. Ecology of rivers and streams. This and the two succeeding books are clearly written, well-illustrated books from Our Living World of Nature series.

15. THE LIFE OF THE POND by William H. Amos, McGraw-Hill, N.Y., 1967, $4.95.

16. THE LIFE OF THE MARSH by William A. Niering, McGraw-Hill, N.Y., 1966, $4.95.

Publications

1. CITIZEN'S ACTION HANDBOOK: REFUSE ACT PERMIT PROGRAM. Available from Natural Resources Defense Council, 36 West 44th St., New York, N.Y. 10036.

2. ENVIRONMENTAL QUALITY, the annual report by the Council on Environmental Quality is published each August. It contains a section on the current status of water pollution and remedial measures. Available from U.S. Government Printing Office, Washington, D.C., $2.

3. MANUAL FOR EVALUATING PUBLIC DRINKING WATER SUPPLIES, Environmental Control Administration, Department of Health, Education and Welfare, Bureau of Water Hygiene, Cincinnati, Ohio 45202. Public Health Service Publication No. 1820.

4. WATER POLLUTION, a workbook published by the Scientists' Institute for Public Information, 30 East 68th St., New York, N.Y., 1970, 75¢.

5. HELP. Help, Department of Environmental Conservation, 50 Wolf Rd., Albany, N.Y. 12201.

Articles

1. "New Efforts Are Being Made To Solve Our Intractable Water Pollution Problem -- But Will They Succeed?" -- CF LETTER, July 1971. The Conservation Foundation, 1717 Massachusetts Ave., NW, Washington, D.C. 20036.

2. "Purification of Nation's Waters Expected to Be Long and Costly" by Gladwin Hill, THE NEW YORK TIMES, March 17, 1970.

3. "Phosphate Replacements: Problems with the Washday Miracle" by Allen L. Hammond, SCIENCE, April 23, 1971.

4. "Warning: The Green Slime Is Here" by Sherwood Davidson Kohn, NEW YORK TIMES MAGAZINE, March 22, 1970.

5. "The Mississippi: Highway of Pollution" by Roy Reed, THE NEW YORK TIMES, December 7, 1971.

6. "Cultural Eutrophication Is Reversible" by Arthur D. Hasler, BIOSCIENCE, 19: 425-431, 1969.

7. "Mercury Is Heavier Than You Think" by Jay Holmes, ESQUIRE, May 1971.

8. "Is the Mediterranean Dying?" by John Cornwell, NEW YORK TIMES MAGAZINE, February 21, 1971.

9. "Flush Toilet Causes Growing Concern for Environment" by David Bird, THE NEW YORK TIMES, July 26, 1971.

10. "Goodbye to the Flush Toilet" by Robert Rodale, ORGANIC GARDENING AND FARMING, November 1971.

Films*

1. THE GIFTS, 28 min., color, $114.68 from Capital Film Laboratories, free loan from Modern Talking Picture Service, but difficult to borrow because this film has received rave reviews. On the quality of water and dangers of pollution.

2. WHO KILLED LAKE ERIE?, 50 min., color, NBC, University of Arizona, University of California, University of Michigan, Florida State University. An excellent NBC-TV documentary.

3. THE RISE AND FALL OF THE GREAT LAKES, 18 min., color, Pyramid. A National Film Board of Canada production designed to stimulate discussion as well as provide information.

4. THE BEAUTIFUL RIVER, 26 min., color, NBC, Florida State University. Traces the 400 miles of the once beautiful and now despoiled Connecticut River.

5. THE PROBLEM WITH WATER IS PEOPLE, 30 min., color or b&w, Contemporary Films/McGraw-Hill. Traces Colorado River from beginning to ocean and discusses its pollution and misuse.

6. THE RIVER MUST DIE, 21 min., Shell Oil Company, free but allow 3 to 4 months for availability. Shows effects of pollutants on river, some manageable by river, some not; microphotography of biochemical effects. Pollution abatement.

7. MEN AT BAY, 26 min., King Screen Productions, $350, rental $35, grades 1-adult. Shows varying conflicting views of industrialist, scientist, reformer, pessimist, the unconcerned, and the alarmist over ecological problems of San Francisco Bay.

8. OUR POISONED WORLD -- WATER, 30 min., Time-Life Films, $350, rental $30, grades 4-adult. Uses Lake Michigan as a case in point for a study of water pollution.

9. CLEAN WATERS, 20 min., color, University of California, rental $9. Illustrates dangers of water pollution and shows proper sewage treatment.

10. THE AGING OF LAKES, 14 min., Encyclopedia Britannica Educational Corporation, $167.50, rental $9, grades 4-12. Shows eutrophication through indiscriminate disposal of sewage, fertilizers, industrial wastes. Good for introduction to aquatic study and monitoring of water quality.

11. LAKES -- AGING AND POLLUTION, 15 min., Centron Educational Films, $195, rental $19.50, grades 4-12. Discusses natural aging and man-caused variety; good as a preliminary to an actual pond study.

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* Addresses of film distributors are given at the end of this guide.

12. PROBLEMS OF CONSERVATION: WATER, 16 min., color, $200, b&w, $102.50, University of Arizona, Encyclopedia Britannica Educational Corporation. Discusses problems of getting and keeping adequate fresh water supply, shows problems of Great Lakes.

13. SLOW DEATH OF THE DESERT WATER, 30 min., color, Indiana University, $315. rental $11.50. The dying of Pyramid Lake in Nevada.

14. RIVER, WHERE DO YOU COME FROM?, 10 min., Learning Corporation of America, $125, rental $10, grades 1-adult. Depicts river's origins from water evaporating from ocean's surface to its return to the sea as a rushing current. Illustrates how river serves man.

15. WHAT IN THE WORLD IS WATER?, 12 min., color, Contemporary Films/McGraw-Hill, $165, rental $12.50. On what water means to man in condensation, irrigation, erosion, water power. Produced by the National Film Board of Canada.

Organizations

1. Water Quality Office
Environmental Protection Agency
1626 K St.
Washington, D.C. 20460

2. Pure Waters Department
Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201

3. Natural Resources Defense Council
36 West 44th St.
New York, N.Y. 10036
The council conducts the Project on Clean Air.

4. Environmental Health Division
World Health Organization
20 Avenue Appia
1211 Geneva, Switzerland
For facts and figures on the world drinking supply.

5. Environmental Control Administration
Department of Health, Education and Welfare
12720 Twinbrook Pkwy.
Rockville, Md. 20852
The administration has recently conducted an extensive survey of drinking water supplies in the United States.

6. Scientists' Institute for Public Information
30 East 68th St.
New York, N.Y. 10021

STRIKING A BALANCE

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STRIKING A BALANCE

Perspective

The saga of DDT is a parable of modern man. Dichlorodiphenyltrichloroethane is the most powerful weapon man ever used against his insect enemies. First, it symbolized human control of nature. Then, it became an instrument par excellence to demonstrate the ecological character of nature, to illuminate the chain of life, to inform man that everything is connected to everything else, to illustrate that the human species is a part of nature.

DDT, a chlorinated hydrocarbon, was synthesized along with thousands of other compounds by German chemists in the 19th century. The formula was filed away and forgotten because nobody knew what to do with it. Early in World War II, Britain and the United States began searching for a new insecticide. The two allies recognized that the struggle was truly global, that the Axis powers must be confronted and beaten in tropical, disease-ridden areas of Africa, the Middle East, Asia, the islands of the Southwest Pacific.

Since the days of Alexander, Caesar, and Hannibal, typhus was a more deadly killer of soldiers than any human enemy. The situation was no different early in World War II except that this time Allied warriors would be subjected to malaria and other tropical diseases as well.

Pyrethrum, a natural insecticide was fine, but not plentiful enough to meet the requirements ahead. Imagine the top secret elation in Washington and London when the Allies learned about the discovery of Paul Mueller, an employee of a Swiss pharmaceutical firm. Mueller found that the long-abandoned compound DDT was quite good at killing a variety of insects and had an extremely low toxicity for man. The compound's virtues did not end here. After intensive secret testing and then field tests, Britain and the United States began to appreciate what a marvel they had!

DDT was incredibly long lasting, eliminating the need for frequent applications; it was impressively potent against an array of insect species; and best of all, if there could be a best, it was cheap to make.

World War II was the first of man's wars in which, for the Allies at least, typhus was not a factor. DDT's impact upon malaria must be counted among the factors contributing to the American defeat of the Japanese in the fighting on the Pacific islands. What could DDT not do in peacetime when its full potential could be exploited to benefit man! Back to back with the discovery of penicillin, an unprecedented vista of good health opened. The euphoria extended to agriculture and economic gains. In November 1944, Business Week hailed DDT in a "Report to Executives: What's Coming in Chemicals," with these words:

> With such a product to stimulate additional research, mankind has new weapons promising eventual freedom from disease-bearing insects such as lice, fleas, flies, mosquitoes, and ticks; from household pests such as moths, cockroaches, and bedbugs, and from the insects that frequently kill crops, orchards, and shade trees.

Four years later, in 1948, Paul Mueller was awarded the Nobel Prize for medicine.

Fourteen years after that, in 1962, biologist Rachel Carson wrote Silent Spring. This was Emile Zola's J'Accuse in modern context. It was a detailed indictment of what was wrong with DDT and with the belief that nature could be abused with impunity. For one thing, DDT killed not only target insects, but many other kinds of creatures as well. It was particularly harmful to those animals higher on the food chains. A study of Lake Michigan showed miniscule amounts of DDT in bottom sediments, only .0085 parts per million. Tiny invertebrates concentrated the poison 48 times, .41 ppm. Fish that fed on the invertebrate animals further concentrated the DDT by a factor of 20, carrying 3 to 8 ppm in their flesh. Herring gulls which fed on the fish had accumulated as much as 3,177 ppm in their fat.

By the time Rachel Carson's book was published, agricultural chemicals were becoming a billion dollar industry. Miss Carson's charges that DDT and similar chemicals were poisoning the environment were met by a massive counteroffensive, and the war was on, raging until this day.

The basic issue for the controversy was stated in a CBS Reports broadcast, "Silent Spring of Rachel Carson." Robert White-Stevens, speaking for the chemical industry, said, "Miss Carson maintains that the balance of nature is a major force in the survival of man whereas the modern chemist, the modern biologist, the modern scientist believes that man is steadily controlling nature, that he already has disrupted the balance of nature with his burgeoning numbers, his cities, his airplanes, his roads."

In reply, Miss Carson said,

> Now these people assumed that the balance of nature was repealed as soon as man came on the scene. Well, you might just as well repeal the law of gravity. The balance of nature is built of a series of interrelationships. You can't change just one thing without changing a good many others.
>
> Now I truly believe that we in this generation must come to terms with nature. And I think we're challenged as mankind has never been challenged before to prove our maturity and mastery — not of nature but of ourselves.

Congressional hearings were held, but no action was taken against DDT because there was no conclusive proof that DDT was directly harmful to humans. However, over the ensuing years a more sophisticated concept competed in the public marketplace -- that human beings could be harmed if their environment were contaminated and degraded. In the years after Rachel Carson, scientists began to find that DDT was indeed poisoning our environment. Trout in New York State's once pristine Lake George no longer could reproduce because of the high levels of DDT they carried; bald eagles and certain species of hawks and peregrine falcons and brown pelicans dwindled alarmingly. An ecologist at Brookhaven National Laboratory, George M. Woodwell, predicted that continued use of DDT on a wide scale for another 25 or 50 years would doom great marine fisheries that helped to feed mankind. Coho salmon, a new sport and commercial fish implanted in Lake Michigan, were found to have 19 ppm of DDT, far above what the Food and Drug Administration considered safe for human consumption, and mother's milk was found to contain more DDT than the Food and Drug Administration considered safe, such was the extent of the pesticide's permeation.

Gradually, state and Federal governments began to curtail the use of DDT by home gardeners and moth sprayers and cotton growers. But this was not the only way that the rosy prognostications of Business Week had gone awry. Insects, species of animals that have survived on this planet for a much longer span than Homo sapiens, refused to succumb to the miracle weapon. Today, at least 224 pest insects are resistant to DDT and other chemical insecticides, including a number of species of Anopholes mosquitoes, the carriers of the malaria parasite.

The battle still rages. Modern industrialized agricultural methods are dependent upon heavy use of chemical pesticides. Large populations depend on that agriculture. A great deal of money is at stake. So is one of man's cherished dreams.

The Broadcast: STRIKING A BALANCE

DDT has been employed by man, both to improve his public health and to increase his agricultural yields. In either case, the targets of the chlorinated hydrocarbon were insects.

For many postwar years, DDT was a boon to agriculture. But the facts are that DDT is not as useful today as it once was because of the ability of insect species to develop resistance. This is a defense mechanism which has served these species well in their survival through eons of time. The application of the poison drastically alters the environment, killing great numbers of insects. There are always a few individuals with the proper genetic components or who are in some way able to withstand the poison. Naturally, these survivors propagate ever larger percentages of the insect population until after X number of generations, virtually the whole population is resistant to the toxin. Many insect species reproduce so rapidly (the boll weevil, a cotton pest, reproduces in just 3 weeks) that the protective change can be disseminated through an insect population in short order.

This is not the only thing that happens. The pesticide not only kills target insects, but their predators as well. Since predators feed on prey, it follows that there are not so many predators in the first place. In the second place, the predators usually cannot reproduce as quickly as their prey. The result is that a natural brake on the size of the target population is removed.

The Canete Valley in Peru serves as a textbook example of the diminishing usefulness of DDT and the turning to other solutions in modern farming. In 1943, before the introduction of chemical pesticides, Peruvian growers harvested 406 pounds of cotton per acre. In 1949, the first chlorinated hydrocarbons were widely used and by 1954 yields had increased to a record 649 pounds per acre. Then the trouble began. The list of pest species had grown from seven to 13 and several of these species had become resistant to DDT. By 1965, the yield in the valley had dropped to 296 pounds per acre, even with up to 25 applications of pesticides, a significant expense in itself. But now the Canete cotton growers have switched to what is known as "integrated control" of pest insects and today the yields in the valley are greater than ever before.

What is this integrated approach? First, let's ask, why are there inundations of agricultural pests? Because today's agriculture relies exclusively on what is called monoculture -- that is, planting vast areas with one type of crop in order to maximize economies of scale. This lack of diversity -- or, to look at it another way, concentration of an insect-specific food -- naturally attracts and nourishes an unnaturally huge population of one particular species. So that insects that might otherwise occur in manageable proportions are turned into pests. In recent times, man's major response has been to use pesticides -- chemical warfare.

Scientists at several branches of the University of California have long been experimenting with a number of other ways to control agricultural pests. The most basic method would be to practice crop diversity. Even without that, there are biological controls which are predicated on studying the ecology of each insect species: seeking out predators and parasites of target insects -- many of them of exotic origin that have been inadvertantly imported; manipulating planting schedules to deny a food supply at crucial times to pest populations; using sex lures to trap and destroy target insects; turning sterilized individuals loose within the pest population (after they mate, there will be no offspring); and using chemical poisons only sparingly and only as a last resort.

Ray F. Smith, chairman of the Department of Entomology and

Parasitology at the University of California, Berkeley, is interviewed about this sophisticated approach to integrated control. A grape grower in the San Joaquin Valley tells of his experiences with integrated control during the past 6 years. We see experiments with integrated control in a laboratory.

In the field, oak trees are sprayed with bacteria to kill oak moths, a strategy which may be effective against the gypsy moth. Another field experiment concerns the synthesizing of a sex lure to trap bark beetles which are destroying pine trees in the western United States. Imported Australian ladybugs and lacewings are used to combat the psyllid which is attacking acacia trees in California.

Paradoxically, today's modern agriculture has become more dependent than ever upon DDT and the battery of chemical pesticides. The so-called "Green Revolution" has accentuated this tendency. In this type of agriculture, the farmer cultivates certain genetic strains of wheat or corn or rice which provide extraordinarily abundant yields but which are extremely vulnerable to pest insects or other blights. They cannot prosper without the chemical shield. The United Nations Food and Agriculture Organization, a stout defender of DDT, says, "Until cheap, safe and efficient substitute pesticides are produced and made easily available, there is no alternative to the judicious use of DDT, especially in the developing world to increase agricultural productivity to feed growing numbers of people on our planet."

To annotate that statement, it should be pointed out that the quantum jump in food production provided by the Green Revolution is expected to avert the widespread famine predicted for the 1970's and 1980's, and to keep food supply abreast of the rising human population until the end of this century. In other words, it has provided time to arrive at a solution to the human population problem.

Norman Borlaug, who is known as the father of the Green Revolution and who was awarded the Nobel Prize in 1970 for his work in developing new wheat strains has been outspoken in the DDT controversy. Borlaug has censured what he called "irresponsible environmentalists." If agriculture is denied the use of these chemicals, Borlaug says, "because of unwise legislation that is now being promoted by a powerful group of hysterical lobbyists who are provoking fear by predicting doom for the world through chemical poisoning, then the world will be doomed not by chemical poisoning but from starvation."

David Brower, perhaps America's foremost conservationist, takes an opposing view and the film provides a dialog between the two men. The World Health Organization's Martin Kaplan takes a more middle ground. Advocating the use of DDT -- in this case in the battle to control malaria -- nevertheless he concedes the chemical's destructiveness to wildlife, acknowledges that we aren't sure what DDT may be doing to the human population even though no direct harm has been proven, and says there is need for more research.

The long-lasting quality of DDT -- its ability to persist in the environment for a long period of time -- is its crucial characteristic in the campaign against malaria. The insecticide's durability means that an area must be sprayed only once or twice a year. It is not necessary that the female Anopholes mosquito which transmits the malaria parasite be sprayed directly. The mosquito usually rests on walls or ceilings before and after feeding on its human host. If these surfaces are coated with DDT, the mosquito picks up small particles of the insecticide on its feet and is poisoned before the parasitic malaria can be transferred. In this way, the malaria cycle is broken and a way is opened to eradicate the disease.

Nations with upwards of 1 billion people fought and successfully reduced malaria in campaigns begun after World War II. The World Health Organization has been and remains today one of the staunchest champions of the use of DDT. In April 1951, the American Journal of Public Health cited figures of reduced malaria cases in country after country and said editorially: "This is one of the most dramatic and significant chapters in the entire history of public health." In Ceylon, there were nearly 3 million cases of malaria in 1948. By 1963, the number had been reduced to just 17 new cases. After that year, the use of DDT was abandoned (Ceylon thought the battle was won) and by 1968 the figure once again had reached the proportions of two decades earlier. With renewed DDT campaigns, the figure has dropped in recent years.

Few persons have condemned the use of DDT against malaria, but the ultimate answer must come through an ecological approach which would include selective draining or water management, selective use of pesticides, and biological controls based on continuing research. Not only does DDT contaminate the environment, but it is gradually producing populations of resistant mosquitoes impervious to the insecticide -- malarial time bombs for future generations.

What can I do?

In general, as backyard gardeners and householders we can learn to deemphasize our reliance on chemical poisons. The sophisticated citizen realizes by now that such substances are insistently thrust into our attention not because they are necessarily the best way to deal with farm and garden problems, but because someone is making money from them. Robert van den Bosch, an entomologist at the University of California at Berkeley, compares the chemical pesticide salesman to the patent medicine man of another era. "The salesman is the key to the system, for he serves as diagnostician, therapist, and pill dispenser. And what is particularly disturbing is that he need not demonstrate technical competence to perform in this multiple capacity."

The hazards in the use of pesticides are now widely recognized, as evidenced by the recent restrictions on their sale and use. Beginning in 1973, DDT is banned in the United States for virtually all uses.

In New York State, the Department of Environmental Conservation, which administers the pesticide control laws has classified pesticides into several categories, as follows:

a. Pesticides which "may be distributed, sold, purchased, possessed and used only upon issuance of a commercial or purchase permit for any uses listed on the approved label as registered with the New York State Department of Environmental Conservation."

b. Pesticides which "may be distributed, sold, purchased, possessed or used only upon issuance of a commercial permit or purchase permit for those purposes listed."

c. Pesticides for which "no permitted uses will be allowed."

The "c" list of pesticides which have no permitted uses, includes DDT, benzene hexachloride (mixed isomers), DDD, TDE, Endrin, mercury compounds, Selenites and Selenates, Strobane, Thallium, Toxaphene, and Bandane.

Most of the other chlorinated hydrocarbons, organic phosphates, and carbamates appear in the other two lists (a) and (b), with their sale, purchase, and uses so highly restricted that they are unobtainable by the ordinary citizen, and cannot be legally used except for an extremely limited number of applications.

The listings are, of course, subject to change according to new research findings, and with the development of new and safer pesticides.

Among the better-known pesticides not subject to the above restrictions, because of their relative safety in the environment when used as directed are methoxychlor, malathion, carbaryl, and plant derivatives such as rotenone, pyrethrins, sabadilla, and related materials.

It is interesting to note that nicotine compounds, also of botanical origin, are highly restricted because of their poisonous nature. Also, a word of caution on the "new" ideas such as sterilants, sex attractants, fungus spores such as milky disease against Japanese beetles, and bacterial sprays such as Bacillus thuringiensis against gypsy moth and other caterpillars. These have to be tested with as much care and thoroughness as the chemicals, and cannot be used indiscriminately. Some are quite specific, others are not, and there are many other dangers that must be eliminated before any of these methods should be used, such as the presence of other, possibly harmful bacteria, and deterioration or breakdown of the materials which might result in harmful effects.

It takes as much time and trouble and money, usually more, to screen these materials than it does for chemicals. This is, of course, a principal reason why they are slow to come into general use. Also, as with chemicals, either they must be profitable to make and market, or the government (you, the taxpayer) must subsidize their manufacture, and the research that goes into making them effective and safe.

All this emphasizes what has already been pointed out -- "natural" control is the best control — that is, insofar as possible plant, cultivate, and live so as to make pesticides unnecessary, or, to the extent that is not possible, use them intelligently and sparingly.

You can set traps, rather than poisons, for rodents. Aphids and leafhoppers can be removed from plants, for instance, by water blasting, but you must use the hose every morning. You can buy natural predators such as ladybugs and lacewing larvae for aphids; praying mantis for aphids, whiteflies, spidermites; trichogramma wasps for cabbage loopers and other caterpillars. Pyramid Nursery, Box 5270, Reno, Nevada 89503, and Rincon Insectary, 1462 Callens Road, Ventura, California 93003, are two places that sell such predators. There are others. Montgomery Ward sells organic gardening garden supplies.

Diversify your planting. Make your backyard area attractive for birds with trees, shrubs, feeders, baths; many birds feed on insects. Encourage lizards, toads, snakes, and salamanders by placing two or three flat boards on the ground. These creatures eat slugs, snails, centipedes, beetles, aphids, termites, ants. Don't kill spiders; they eat insects. Try pulling weeds manually rather than using herbicides. You can kill weeds near sidewalks and driveways by pouring boiling water on them. Don't be upset by a few insects and insect holes in your plants.

For further information

Books

1. SILENT SPRING by Rachel Carson; Crest, Fawcett Publications, Greenwich, Conn., 1962, 75¢. The classic that started it all.
2. SINCE SILENT SPRING by Frank Graham, Jr.; Houghton Mifflin, Boston, 1970, $6.95. The Rachel Carson story and what happened after publication of her best seller.

3. PESTICIDES AND THE LIVING LANDSCAPE by Robert L. Rudd; University of Wisconsin Press, Madison, 1964, $1.95. Another SILENT SPRING with more documentation.

4. CHEMICAL FALLOUT edited by Morton W. Miller and George G. Berg; Charles C. Thomas, Springfield, Ill., 1969, $22.50. The document of a conference attended by Swedish scientists who came to tell American colleagues about the evils of mercury poisoning and learned themselves about DDT. The book also contains the arguments of scientists who discount the evils of DDT.

5. WHERE HAVE ALL THE FLOWERS FISHES BIRDS TREES WATER AND AIR GONE by Osborn Segerberg, Jr.,; McKay, N.Y., 1971, $2.95.

6. PEREGRINE FALCON POPULATIONS: THEIR BIOLOGY AND DECLINE edited by J. J. Hickey; University of Wisconsin Press, Madison, 1969.

7. HARVEST OF DEATH, Chemical Warfare in Vietnam and Cambodia by J. B. Neilands, et al.; Free Press, N.Y., 1972, $10. The story of defoliation as seen by five scientists.

8. YOUR ENVIRONMENT AND WHAT YOU CAN DO ABOUT IT by Richard Saltonstall, Jr.; Walker, N.Y., 1970, $6.95.

9. IF YOU WANT TO SAVE YOUR ENVIRONMENT...START AT HOME by Carroll Harrington, et al.; Hawthorn, N.Y., 1970, $2.50.

10. THE ENVIRONMENT, THE ESTABLISHMENT AND THE LAW by Henkin, Harmon, et al.; Houghton Mifflin, Boston, 1971, $4.50. The DDT case as fought before a state body in Wisconsin.

Publications

1. PESTICIDES, 1970, a workbook prepared by Scientists' Institute for Public Information, 30 East 68th St., N.Y. 10021. 75¢.

2. ECOLOGICAL EFFECTS OF PESTICIDES ON NON-TARGET SPECIES by David Pimentel; June 1971, Executive Office of the President, Office of Science and Technology. Obtainable from U.S. Government Printing Office, Washington, D.C. 20402. $2.

Articles

1. ENVIRONMENT Magazine devoted most of its December 1969, issue to DDT and includes a chart of insects that have developed resistance to DDT and other pesticides.

2. "The Pesticide Syndrome -- Diagnosis and Suggested Prophylaxis" by Richard L. Coutt and Ray F. Smith; paper, American Association for the Advancement of Science Meeting, Boston, December 1969.

3. "The Developing Program of Integrated Control of Cotton Pests in California" by Robert van den Bosch, et al.; A.A.A.S. Meeting, Boston, December 1969.

4. "Pesticides in the Estuary" by Philip A. Butler, U.S. Bureau of Commercial Fisheries, Contribution No. 85, from a symposium held at Louisiana State University, July 19-20, 1967.

5. "DDT in the Biosphere: Where Does It Go?" by George M. Woodwell, Paul P. Craig, and Horton A. Johnson, SCIENCE, December 10, 1971.

6. "Report of the Secretary's Commission on Pesticides and their Relation to Environmental Health," a Department of Health, Education and Welfare publication discussing DDT residues in man. U.S. Government Printing Office, Washington, D.C. 20402.

7. "Chlorinated Hydrocarbons and Eggshell Changes in Raptorial and Fish-eating Birds" by J. J. Hickey and D. W. Anderson, SCIENCE, 162, 271-3, 1968.

8. "DDT Residues in Pacific Sea Birds: a persistent insecticide in marine food chains" by Robert Risebrough, et al.; NATURE, 216, 589-91, 1967.

9. "Toxic Substances and Ecological Cycles" by George M. Woodwell, SCIENTIFIC AMERICAN, 216, 24-31, 1967.

10. "DDT Reduces Photosynthesis by Marine Phytoplankton" by Charles F. Wurster, SCIENCE, 159, 1474-5, 1968.

11. The petition brought by the Environmental Defense Fund, Sierra Club, West Michigan Environmental Action Council, and National Audubon Society to prevent the Secretary of Agriculture from authorizing further use of DDT contains an extensive bibliography of the scientific literature.

12. "The Green Revolution: Cornucopia or Pandora's Box?" by Clifton R. Wharton, Jr., FOREIGN AFFAIRS, April 1969.

13. "Mankind and Civilization at Another Crossroad" by Norman E. Borlaug; McDougall Memorial Lecture, 1971, United Nations Food and Agriculture Organization.

14. "Man and His Environment — Crisis or Challenge?" by Earl L. Butz; AGRICULTURAL CHEMICALS 26(6): 12-13.

15. "Eagles, Affluence and Pesticides" by Andrew J. Rogers, Presidential Address, American Mosquito Control Association, April 24, 1972. Obtainable from Dr. Rogers at West Florida Research Laboratory, Panama City, Florida 32401.

Films*

1. SILENT SPRING OF RACHEL CARSON, 54 min., b&w, Contemporary Films/McGraw-Hill, $275, rental $15. The classic confrontation of Miss Carson and the agricultural chemical industry over DDT.

2. POISONS, PESTS AND PEOPLE, 58 min., b&w, Contemporary Films/McGraw-Hill, $350, rental $25. Examines effects of widespread use of chemical insecticides on insects and on warm-blooded creatures; also, discusses alternatives. Produced by the National Film Board of Canada.

3. THE POISONED PLANET, 19 min., Contemporary Films/McGraw-Hill, $260, rental $24, grades 7-12. Produced for ABC-TV, film explores widespread use of chemical pesticides.

4. OF BROCOLI AND PELICANS AND CELERY AND SEALS, 30 min., color, Indiana University, $315, rental $11.50, grades 4-adult. DDT moving up the food chain off California coast, pelicans unable to hatch young. Produced by National Educational Television for Our Vanishing Wilderness series.

5. THE CHAIN OF LIFE, 30 min., color, Indiana University, $315, rental $11.50. The food chain of life and what chemical pesticides do to it. From Our Vanishing Wilderness series produced by National Educational Television.

6. DDT/SOS, 30 min., color, WCBS-TV News, free. A discussion of marine pollution.

7. THE WINNERS, 30 min., color, Contemporary Films/McGraw-Hill, $350, rental $18. Film shows why insects are successful, their diversity and remarkable adaptability; explains how and how not to control them.

8. OUR POISONED WORLD -- PESTICIDES, 30 min., Time-Life Films, $350, rental $30, grades 4-adult. Concentrates on biological magnification of persistent pesticides through food chain.

9. THE AMERICAN BALD EAGLE, 16 min., Coronet, color $195, b&w $97.50, grades 4-college. Relates endangered species to activities of man. From film produced by Laboratory of Ornithology, Cornell University.

10. THE FOOD REVOLUTION, 26 min., color, Contemporary Films/McGraw-Hill, $350, rental $18. On the Green Revolution and new methods to synthesize food. Produced by CBS for the 21st Century.

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* Addresses of film distributors are given at the end of this guide.

Organizations

1. Pesticides Office
Environmental Protection Agency
1626 K St.
Washington, D.C. 20460

2. Council on Environmental Quality
722 Jackson Pl., NW
Washington, D.C. 20006

3. U.S. Department of Agriculture
The Mall, between 12th and 14th St., SW
Washington, D.C. 20250

4. Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201

5. National Audubon Society
1130 Fifth Ave.
New York, N.Y. 10028

6. Environmental Defense Fund
162 Old Town Rd.
East Setauket, N.Y. 11733

7. World Health Organization
20 Avenue Appia
1211 Geneva, Switzerland

8. Food and Agriculture Organization
Via delle Terme di Caracalla-00100
Rome, Italy

9. U.S. Department of Health, Education and Welfare
330 Independence Ave., SW
Washington, D.C. 20201

10. American Association of Economic Entomologists
4603 Calvert Rd.
College Park, Md. 20740

11. American Mosquito Control Association
P.O. Box 278
Selma, Calif. 93662

12. State Agricultural Experimental Stations or State Agricultural Colleges in all states.

THE AIR WE BREATHE

157/158

THE AIR WE BREATHE

Perspective

Like the fishes, we terrestrial animals live in an ocean; but, of course, our medium is air.

It is also a sheltering sky.

In both capacities, the marvelously variegated and complex atmosphere sustains life.

What we call the atmosphere -- all the gaseous matter surrounding the earth -- has been divided into a series of spheres, one enclosing the other until we get far out into space. At the bottom and extending upwards for 10 miles is the troposphere or turning, changing sphere. This is the sphere we live in. It contains 80 percent of the gaseous material, the weather and pollution, and is in continual movement -- fortunately, for this is an important cleansing mechanism. Lying on top of the troposphere is the extremely stable stratosphere, or stratified sphere. Most of the remaining gases are in the second 10 miles above the earth's surface, so that 99 percent of all the gaseous matter exists in a 20-mile band. The stratosphere, or what some people call the lower stratosphere, extends from 10 miles to 30 miles in altitude. Temperatures gradually increase as we ascend so that at the 30 mile level the temperatures are close to what they are at the earth's surface.

In the upper stratosphere, the temperature begins to drop until an altitude of 50 miles, an area called the mesosphere is reached and then rises in the thermosphere to fantastically high temperatures, reaching 2,250 degrees Fahrenheit at 300 miles. Above this level, particles are so thinly distributed that upward-moving molecules may escape from the earth's gravitation, and so this region is called the exosphere. Electrically charged molecules range into space as far as 50,000 miles from earth.

The atmosphere is hit constantly with ultraviolet rays, which are lethal to life. From 75 miles down to 30 miles, some of the short wavelength ultraviolet light is absorbed by oxygen molecules, splitting the O_2 into single atoms. Some of these atoms are absorbed into the oxygen in the 10 to 30 mile layer, forming O_3 or ozone. Ozone absorbs the deadly ultraviolet light, at the same time absorbing heat. With the stratosphere warmer than the upper levels of the troposphere, we have a mammoth inversion, so that in a sense the troposphere is trapped beneath the stratospheric ceiling.

There is another trapping mechanism at work. The solar radiation that passes through the atmospheric screen is re-radiated off the earth's surface and would escape back out into space except that about two-thirds of this heat-energy is caught by water vapor and carbon dioxide, and some of it once again is sent earthward. Because of this so-called "greenhouse effect," our temperature on earth is 65 degrees F. warmer than it would otherwise be.

This then is our ocean, composed of 78 percent nitrogen, 21 percent oxygen, with argon, neon, helium, krypton, xenon, hydrogen, methane and nitrous oxide making up the other permanent gases -- all in an almost perfect mix. There also are variable atmospheric gases -- water vapor, carbon dioxide, ozone, sulphur dioxide, and nitrogen dioxide.

Life as we know it today has adapted itself to the remarkably consistent conditions of this sheltering sky. The ratio of the oxygen (21 parts per hundred) to carbon dioxide (300 parts per million) in the atmosphere apparently has remained constant for eons -- the plants taking the CO_2 and capturing the sun's energy through photosynthesis and providing animal life with oxygen and food and the animals, in turn, replenishing the CO_2.

Man has triggered enough alterations in the atmosphere to cause some scientists to wonder, and some to worry. Will SST's flying in the stratosphere rip open the ozone shield to allow blinding, killing ultraviolet light to pour through? Will an increase in carbon dioxide trap more heat, melting the polar icecaps, raising the oceans, flooding coastal cities? Actually, our average temperature has cooled by one-half a degree since 1940. Could this be because of more particulates -- pollution in the air? our shroud?

Modern man's lungs are black from the soot and filth in his air. His blood carries airborne lead, his fatty tissues, airborne DDT. Bronchitis, asthma, emphysema, asbestosis, and lung cancer are modern epidemics plaguing urban man. Emphysema has doubled every 5 years since World War II. Lung cancer, once a rarity, now kills more people than all other cancers combined. Air pollution "episodes" have killed outright. In Donora, Pennsylvania, in 1948 almost half of the town's 14,000 inhabitants fell ill and 20 died. In London in 1952, during one period lasting several days, 1,600 more deaths occurred than would normally have taken place.

The Broadcast: THE AIR WE BREATHE

The broadcast opens dramatically with the sound of breathing as we see scenes of air pollution -- a vivid reminder that we cannot inhale filth without injury to ourselves. Dr. Stephen Ayres, director of the cardiopulmonary department at New York's St. Vincent Medical Center, confirms this impression. "We do know that air pollution at certain levels can injure human health. It can particularly injure the lungs and perhaps other body tissues," he says, and then adds: "We've identified the health effects of air pollution to rather accurate degrees. We really haven't done a very good job in control."

The broadcast then establishes that the automobile is the single most important cause of air pollution, causing 60 to 80 percent of the contamination in many cities. There are various efforts to control the pollution — stringent emission control standards, careful carburetor regulation, spot road checks in Japan and, of course, the Clean Air Law in the United States designed to make new cars manufactured in 1975-76, 90 percent cleaner than those of 1970. However, the number of cars on the road keeps increasing, and it can be said that the problem of auto pollution is far from solved. Robert Rickles, former New York City Air Resources Commissioner, says, "Obviously all the people who sell gasoline, who sell cars, who sell concrete, sell steel are all in favor of more roads and less, or not so much, mass transit. But I think public opinion is swinging very much against them. So that I think that we will see a great deal more money spent in mass transit."

Refineries, mills, mines, the heating of homes and factories, incinerators and, particularly, electric utilities also produce air pollution. Charles Luce, board chairman of New York's Consolidated Edison Company points out that more mass transit, greater treatment of sewage, and recycling of junked autos require more electricity, so the dilemma is that in order to purify the environment in other ways means more electricity with its impact on the environment. One way, or at least part way, out of this dilemma, Luce says, is: don't waste electricity...or oil or gasoline or coal or any other form of energy. He says a campaign by his company to conserve electricity has shown results.

Vincent Schaefer, a meteorologist with the State University of New York at Albany, suggests that conventional smokestacks be replaced with horizontal ones shaped like pretzels or corkscrews so that the waste particles fall down and are removed by conveyor belt without being spewed into the atmosphere where they can remain for a month and circumnavigate the globe.

On the subject of human health, Ayres suggests that one reason cigarette smoking may be so harmful is that air pollutants are drawn through the cigarette's hot zone, thus creating exotic chemical vapors that the lungs are not accustomed to processing. Asbestos is another dangerous airborne contaminant, one closely linked to lung cancer. Asthma, bronchitis, and lung diseases are common to the industrialized cities of the world.

"People want to be healthy," Ayres says, "and I think until very recently everyone thought that all that was needed was perhaps a few tablets, a pill once in a while and good health was guaranteed. We know now that adequate diet, adequate exercise, and a reasonably clean environment are absolutely necessary to have decent human health. If we can hammer that message home that clean air means good health, and dirty air means bad health, we will have accomplished a great deal."

Schaefer adds that if the individual wants to make a contribution in eliminating or alleviating air or any other kind of pollution, he must become educated to understand what the problem is. In the long run, we, the people, are the ones who have to make these decisions and our industrialists, in one sense are merely our servants, just as public officials are our servants. "I think that the sooner the general public of the world understands this, that we are all in this together, and that somehow or other we have to find a better way, then I think we will begin to solve some of the problems, and not until then."

Finally, Maurice Strong, Secretary-General of the United Nations Conference on Human Environment, explains that all life on the planet is dependent upon the delicate balance of the heat we receive from the sun and the amount of heat reflected back into space, which is regulated by the filtering quality of the atmosphere. Tampering with that atmosphere can lead to destruction -- and no one knows for sure just what we are doing in this area. Air pollution, he reminds, recognizes no boundaries and the United Nations "is the only global organization that can deal with this problem on an overall basis."

What can I do?

Don't smoke.

More than 280 million tons of pollutants are pumped into the air over America each year. More than half of this contamination consists of extremely lethal carbon monoxide. The second major air pollutant is highly dangerous sulphur dioxide, followed by hydrocarbons, particulates, and nitrogen oxides. Subject to sunlight, the nitrogen oxides combine with gaseous hydrocarbons to form a complex variety of secondary pollutants called photochemical oxidants. These oxidants, with particulates, make up what we know as smog.

Transportation, mainly auto emissions, accounts for more than half of these pollutants -- nearly two-thirds of the carbon monoxide, nearly half of the hydrocarbons, more than one-third of the nitrogen oxides. In cities, these percentages go up 50 to 100 percent. It is obvious that measures taken to reduce driving autos and increase public transportation are the most effective individual/collective responses to air pollution (see What can I do? sections of THE CAR IN THE CITY and SIX FATHOMS DEEP). This is particularly true in urban areas where carbon monoxide levels at times exceed the danger point, where residents carry higher burdens of lead in their blood, and where lung ailments are so common.

Electric power plants are the major producers of sulphur dioxide and along with other fuel burners produce most of the rest of the nitrogen oxide pollution. Cutting our demand and use of electricity will bring a bonus of cleaner air to us as individuals and as a group (see the What can I do? sections mentioned above). Review all your uses and dependencies on electric power; then consider how many you can forego without great inconvenience and how many you can find substitutes for (wearing a sweater around the house will conserve coal and heating expenses as well).

The 1970 Clean Air act authorizes citizen suits in order to enforce provisions of the act. For a copy of the act, write to Office of Air Programs, Environmental Protection Agency, Washington, D.C. The Natural Resources Defense Council is monitoring the implementation and enforcement of the act in conjunction with the Scientists' Institute for Public Information with a Project on Clean Air, and can be consulted for current information.

Finally, "it is better to light a candle than to curse the darkness." Plant a tree.

For further information

Books

1. THE UNCLEAN SKY by Louis J. Battan; Doubleday Anchor, N.Y., $1.45. A meteorologist looks at air pollution.
2. THIS VITAL AIR, THIS VITAL WATER by Thomas G. Aylesworth; Rand McNally, Chicago, 1968, $4.95. An introduction to air pollution.

3. AIR POLLUTION by Charles W. Lavaroni and Patrick A. O'Donnell; Addison-Wesley, 1971, $1.68. For students (grades 7-9); with experiments.

4. YOUR ENVIRONMENT AND WHAT YOU CAN DO ABOUT IT by Richard Saltonstall, Jr.; Walker, N.Y., 1970, $6.95. Contains a primer on air pollution and what you can do about it.

5. CLEANING OUR ENVIRONMENT: The Chemical Basis for Action; American Chemical Society, Washington, D.C. Good factual material on air pollution.

6. THE POLITICS OF POLLUTION by J. C. Davie, Pegasus, 1970, $6. Good review of the legislative process to achieve air pollution laws.

Publications

1. AIR POLLUTION, 1970, a workbook prepared by Scientists' Institute for Public Information, 30 East 68th St., New York, N.Y., 75¢.

2. THE PROPOSED NATIONAL PRIMARY AND SECONDARY AIR QUALITY STANDARDS: AN ANALYSIS by Scientists' Institute for Public Information, 30 East 68th St., New York, N.Y., 75¢.

3. ENVIRONMENTAL QUALITY, the annual report published each August by the Council on Environmental Quality includes authoritative statements on air pollution. First two published in 1970, 1971. U.S. Government Printing Office, Washington, D.C. 20402. $2.

4. INADVERTENT MODIFICATION OF WEATHER AND CLIMATE BY ATMOSPHERIC POLLUTANTS by E. W. Barrett, et al. ESSA Technical Report ERL 185-APCL 15. $1. U.S. Government Printing Office, Washington, D.C. 20402.

5. HELP. Help, Department of Environmental Conservation, 50 Wolf Rd., Albany, N.Y. 12201.

Articles

1. "The Ambient Air" by Edith Iglauer, THE NEW YORKER, April 13, 1968. "Must" reading on air pollution.

2. "The Atmosphere: A Clouded Horizon" by Eugene Peterson, ENVIRONMENT, April 1970. On whether CO_2 increase will balance dust and other pollution.

3. "U.S. Agency Bars Delay on Cutting Auto Pollutants" by E. W. Kenworthy, THE NEW YORK TIMES, May 13, 1972. Contains a good summary of the Clean Air Law.

4. "Far-Reaching Bill Pending in Congress Would Launch Major New Attacks on Air Pollution," CF LETTER, October 1970. The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C. 20036. A backgrounder on the 1970 Clean Air act.

5. "Air Quality Rules for 6 Pollutants Given for Nation" by E. W. Kenworthy, THE NEW YORK TIMES, April 30, 1971.

6. "Hello, Energy; Goodbye, Big Sky" by John Neary, LIFE Magazine, April 16, 1971. About the new coal power plants in the Southwest.

7. "Why the U.S. Is in an Energy Crisis" by Lawrence Mayer, FORTUNE, November 1970.

8. "Can We Have All the Electricity We Want and a Decent Environment Too?" CF Letter, March 1970. The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C. 20036.

9. "Out of the Fog," TIME Magazine, December 12, 1969. On how London has cleaned up its air.

10. "Rise in Rainwater Acidity in the Northeast Tied to Air Pollution" by David Bird, THE NEW YORK TIMES, January 30, 1972. About another "side" effect.

11. "The Cloud Comes to Quibbletown" by Donald Jackson, LIFE Magazine, December 10, 1971. About an air pollution incident in New Jersey in September 1971.

12. "Asbestos" by I. J. Selikoff, ENVIRONMENT, March 1969. All about asbestos dust.

Films*

1. OUR POISONED WORLD -- AIR, 30 min., Time-Life Films, $350, rental $30, grades 4-adult. A good overview.

2. AIR POLLUTION, 10 min., Sterling Educational Films, $135, grades 7-12. A general introductory film to causes and effects of air pollution.

3. THE POISONED AIR, 50 min., purchase Carousel, rental University of Minnesota, University of California, Pennsylvania State University, University of Arizona, Roa's Films. A CBS News production balancing the soothing views of the auto and petroleum industries with those of Senator Edmund Muskie, John Gardner, and a former Los Angeles smog control director.

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* Addresses of film distributors are given at the end of this guide.

4. AIR POLLUTION: TAKE A DEEP DEADLY BREATH, 54 min., color, University of Arizona, Kent State University, Contemporary Films/McGraw-Hill, rental $35. An ABC documentary on the subject.

5. PROBLEMS OF CONSERVATION: AIR, 15 min., Encyclopedia Britannica Educational Corporation, color $167.50, b&w $86. Explains difference between natural and manmade pollution, what is being done to help solve the problem through technological and legislative controls.

6. AIR POLLUTION, 15 min., color, Encyclopedia Britannica Educational Corporation, $167.50 b&w. Explains difference between natural and manmade pollution, what is being done to help solve the problem through technological and legislative controls.

7. THE FIRST MILE UP, 28 min., b&w, Contemporary Films/McGraw-Hill, $200, rental $14. Facts and statistics, produced by the National Film Board of Canada.

8. AUTOS, AUTOS EVERYWHERE, 26 min., color, University of Southern California, Indiana University, Kent State University, Contemporary Films/McGraw-Hill. A prediction of what will be done to cars to reduce pollution and other hazards. A CBS production for the 21st Century.

Organizations

1. Air Pollution Control Office
   Environmental Protection Agency
   1626 K St.
   Washington, D.C. 20460

2. Department of Environmental Conservation
   50 Wolf Rd.
   Albany, N.Y. 12201

3. Environmental Protection Administration
   Municipal Bldg.
   New York, N.Y. 10007

4. Environmental Health Division
   World Health Organization
   20 Avenue Appia
   1211 Geneva, Switzerland

5. Natural Resources Defense Council
   36 West 44th St.
   New York, N.Y. 10036

6. Scientists' Institute for Public Information
   30 East 68th St.
   New York, N.Y. 10021

7. Citizens for Clean Air
   502 Park Ave.
   New York, N.Y. 10022

ONLY
ONE EARTH

ONLY ONE EARTH
(THE STOCKHOLM CONFERENCE)

Perspective

Like the meeting of nobles in 1215 that led to the Magna Carta and formation of British parliament or that of the Americans at Philadelphia in 1787 that led to the United States Constitution, the conference at Stockholm in June 1972, could signify a profound change in the course of human events. The United Nations Conference on the Human Environment was at once a recognition that humans had gained a new awareness of their relationship to the environment and a point of departure for new programs of action based on that awareness. It was a world focal point of a modern revolution in human thought and, consequently, human behavior.

This revolution, due in no small part to today's communications, took place like a wild fire. It was just one decade earlier that Rachel Carson in Silent Spring sounded the first popular warning against environmental contamination. Even in 1968 when Sweden first suggested a world conference on the environment, pollution and other environmental stories were not the meat of news editors. The first Earth day preceded the conference by barely 2 years. The lack of environmental information was massive; in fact, the first global inventories were collected to get ready for the conference.

The conference has achieved other kinds of understanding and suggested other potentialities. For example, undeveloped countries initially were apathetic, even hostile to the idea of such a conference where environmental standards and concerns might take precedence over economic development. At first, it appeared to be another ploy on the part of "haves" to preserve their advantage over poorer peoples. However, after patient groundwork, particularly by Conference Secretary-General Maurice Strong, both sides came to recognize a mutuality of interests. Developed nations accepted the aspirations of less developed neighbors to develop resources, as quickly as possible, in order to improve the status of their peoples. At the same time, undeveloped nations began to understand that economic improvement may not have to be accompanied by environmental degradation if new methods and managements are considered. The environmental mistakes of the industrialized countries could serve as valuable lessons of what not to do.

Beyond that, everyone began to take to heart the concept that it really is one world, that nations and peoples are interdependent, that no matter who pollutes the oceans or the air -- everyone suffers.

Moreover, the environmental issue was one which could be approached universally with positive attitudes. After all, the earth, the biosphere are home for everyone. This made environmental problems quite different from all the other problems tackled by the United Nations. As Maurice Strong put it, "Other issues -- nuclear disarmament and warfare; aid and assistance from one country to another and so on -- these are the time-consumers. On environment, you start with a common interest, from both the socialist block of the East and the industrialized countries of the West." Furthermore, environment is "the most international of all the great issues facing the world today. It's not a conference on one specialized area. It's on the whole environment, so it allows us to do something that we haven't done before -- deal with a whole series of interacting relationships. Almost every sector of human activity will be affected."

Strong, a Canadian industrialist before he took over the U.N. post, feels that if the United Nations deals effectively with the environmental question, it will revitalize the world organization. Here would be an example where nations could work together effectively, cooperate, and we would have a positive image to replace so many instances of impasse, frustration, and obstruction.

In this context, Mr. Strong's words take on a larger meaning: "The overriding thing we have to do is convince all the countries that the United Nations framework offers the only available, usable instrument we have for reconciling our differences."

The Broadcast: ONLY ONE EARTH (THE STOCKHOLM CONFERENCE)

From June 5 to June 16, 1972, more than 1,000 high level political representatives from 114 member countries[1] of the United Nations met at Stockholm, Sweden, at a truly historic conference. It was the first time that men and women gathered to organize and certify a global program for human interactions with the environment. This was the United Nations Conference on the Human Environment.

There were colorful touches of pageantry as the participants attended a Swedish welcoming ceremony at the Stockholm Opera House. This was followed by the official inauguration in the Folkets Hus, the site for the plenary sessions of the conference. The three conference committees met in the New Parliament Building and the Old Parliament Building in downtown Stockholm.

The work of the conference had been prepared for carefully and intensively. To give some idea of the scope of the preparation:

Sweden originally proposed, in 1968, that the United Nations convene a conference on the problems of the human environment. On December 3, 1968, the General Assembly decided unanimously that a Conference on the Human Environment should be held, and the following year Sweden invited the United Nations to meet in Stockholm. This invitation was accepted in December 1969. At the same time, a 27-nation Preparatory Committee was established and work began on the conference.

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[1] The Soviet Union and other Communist bloc nations boycotted the conference, in a political gesture, because Communist East Germany was not permitted representation.

All told, 115 governments actively participated in the preparation. Seventy-seven of them presented national reports, most constituting their first surveys of their own environmental concern. Most of these countries also set up some form of governmental machinery to deal with environmental problems, so that tangible results were achieved even in advance of the conference itself.

Twelve thousand pages of material -- environmental reports and recommendations for action from governments, agencies, study groups, scientists, observers -- are contained in 350 basic documents submitted to the conference secretariat. This information was distilled into some 600 pages for delegates to study, but the full reports -- what amounts to the first global survey of environmental issues and concerns -- were available in a special Conference Library in Stockholm. Following the conference, the material will be made available as a reference source.

Among the major achievements of the conference were these:

The espousal of a 26-point Declaration on the Human Environment, which says in part that "man has the fundamental right to adequate conditions of life, in an environment of a quality which permits a life of dignity and well-being, and bears a solemn responsibility to protect and improve the environment for present and future generations." Also, the natural resources of earth, including the air, water, land, flora and fauna, and especially representative samples of natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management as appropriate. It goes on to detail specific areas such as preservation of renewable and nonrenewable resources, the control of discharge of toxic materials into the environment, the responsibility of national policies to improve environmental conditions, and the responsibility of governments for any environmental degradation their activities may cause beyond their own boundaries. The Declaration also states: "Man and his environment must be spared the effects of nuclear weapons and all other means of mass destruction. States must strive to reach prompt agreement, in the relevant international organs, on the elimination and complete destruction of such weapons."

While the Declaration is not binding upon member states, it is expected to carry great moral weight and is regarded as a sort of constitution against which future environmental actions could be measured by world opinion.

Approval of an "action program" involving some 200 recommendations in fields that range from monitoring climate change or oceanic pollution to promoting birth control and the preservation of the world's vanishing diversity of plant and animal species. This action is divided into three parts. First and most immediately important is Earthwatch, a global environmental assessment program consisting of evaluation and review, research, monitoring, and information exchange. In order to carry out the monitoring, it is proposed to establish a network of 10 baseline stations to study long-term global trends, along with 100 stations to monitor air pollution on a regional basis. In addition, regional and global networks of research centers and biological reserves would be developed to analyze the structure and functioning of the world's ecosystems. Earthwatch would amass an unprecedented amount of environmental information.

The second part of the action plan would concentrate on how best to use that information in environmental management activities. These would include measures for international cooperation, the management of human activities that have impact upon the environment and management of environmental resources, the setting of goals, and the adoption of legal and economic measures to achieve the goals.

Part three would consist of public information, education, training, and financing measures to support the action plan.

The Stockholm Conference also acted upon six areas of especial concern. Two subjects were assigned to each of three conference committees. The first area of concern was entitled "Planning and management of human settlements for environmental quality." The present environmental crisis faced by human settlement is posed by the twin challenge of urban growth and population distribution. The goal is to create future cities that are efficient and functional, which foster the well-being of man, and which do not disrupt the ecological balance of the environment. Aspects of the settlements crisis requiring urgent attention include the problems of sanitary water supply, better and more housing, more intelligent land-use policies. Most of this work must be carried out by national governments.

Section two, "Environmental aspects of natural resources management," concentrates on the balance between available natural resources and competing human demands upon them. Resources must be considered in a broad context, and can no longer be considered strictly from single-use or single benefit viewpoints. So natural resources must be managed in an integrated manner with environmental and social amenities taken into consideration. The ideal is always wise exploitation, plus optimum social amenity. While most proposals were fashioned for national implementation, some called for international action or cooperation. One is aimed at stopping the depletion of genetic stocks -- specifically, to avert the disappearance of presently endangered species of plants and animals. The conference called for a 10-year moratorium on commercial whaling.

Section three, "Identification and control of pollutants of broad international significance," deals with worldwide problems of pollution. Prime areas of concern include prevention of food contamination, preservation of air and water quality, global assessment of climate changes, study of the effects of pollutants on terrestrial ecosystems, and a comprehensive approach to preserve the quality of the oceans. Earthwatch, management programs, and information and educational programs -- all mentioned previously in the action plan -- figure in this section.

Section four deals with "Educational, informational, social and cultural aspects of environmental issues." Actions taken in the social and cultural areas are as complex as the environment itself and therefore should be considered in an interdisciplinary basis. UNESCO should take the lead here, certainly as far as educational action is concerned. Public information must parallel the educational campaign in order to enlighten and motivate the public to give broad support to environmental reforms and management. Additionally, the biological and cultural heritage must be rationally managed through preserving certain monument areas, protecting certain islands for science, and so forth.

Section five concerns "Development and environment" and is of particular interest to developing nations. The environmental problems of the developing world are often different from those of heavily industrialized nations inasmuch as they reflect a lack of economic development. The role of the United Nations would be to help these nations to develop, while at the same time avoiding the mistakes and distortions committed in the industrialized countries. Another role would be to anticipate areas of conflict and reduce tensions between developing and industrialized nations in the coming environmental campaigns.

Finally, the conference dealt with what could be the most important long-range result of the meeting at Stockholm -- the establishment of an ongoing organization within the United Nations to coordinate its environmental programs. This is the permanent successor to the conference and contains the administrative machinery to carry out its functions. Also the conference approved an Environment Fund to cover that part of the international effort not paid for by specialized agencies and national governments. Pledges indicate that the fund will reach at least $100 million, which has been considered the minimum requirement for the first 5 years of operation.

In his concluding speech, conference secretary-general Maurice Strong said, "The fundamental task of the Stockholm conference has been to take the political decisions that will enable the community of nations to act together in a manner consistent with the earth's physical interdependence. This was our mandate. This is what we did."

What can I do?

Perhaps the most important thing you can do is to reexamine your overall attitudes toward environment and toward the United Nations in the light of this new campaign on the human environment. An entirely new initiative is now being taken by the world organization in response to an entirely different kind of global crisis. And international cooperation is a prerequisite for any effective action on the global scale.

Despite some ruffled political feelings and an uncomfortable reminder of oldtime political infighting and intransigence (over participation of Communist East Germany), the conference was refreshingly free of the past failures and partisan forms of noncooperation that have plagued U.N. operations. This time, on this issue, the tenor is one of cooperation. The attitude is one of "can do."

The United Nations and the Conference on the Human Environment need support, moral and financial. The individual can supply the former. If enough people do, their governments will be more disposed to supply the latter.

This conference has demonstrated technically, scientifically, practically that human interdependence is more important than human differences. Each person's confidence in the first, rather than suspicions over the second, can contribute to environmental protection.

For further information

Books

1. ONLY ONE EARTH: The Care and Maintenance of a Small Planet by Barbara Ward and Rene Dubos; W. W. Norton, hardcover; Ballantine, soft cover; N.Y., 1972. This contains the contributions of 152 distinguished individuals in 58 countries who served as consultants for what is a world report on the human environment, and the general readers' background text for the Stockholm Conference.
2. MAN IN THE LIVING ENVIRONMENT; The National Institute of Ecology; University of Wisconsin Press, Madison, Wisc., 1971. A collective analysis of the important world problems concerned with environmental quality and management by a group of ecologists.

3. IN DEFENSE OF EARTH by Lynton K. Caldwell; Indiana University Press, Bloomington, Ind., 1972, $8.50. A study of environmental policy and administration.

4. EVERYMAN'S UNITED NATIONS; United Nations, N.Y.; U.N. Publication E. 67.15, $2.50. All about the U.N.

5. Write to:
   United Nations Association of the U.S.A.
   833 United Nations Plaza
   New York, N.Y. 10017
   For publications list on United Nations.

6. UNA-USA World Affairs Book Center
   345 East 46th St.
   New York, N.Y. 10017

Publications

1. MAN'S HOME is a series of five booklets prepared with the cooperation of the Secretariat of the United Nations Conference on the Human Environment to provide a general understanding of major environmental issues discussed at the Stockholm Conference. United Nations, N.Y. 10017, $1.

2. PROBLEMS OF THE HUMAN ENVIRONMENT, report of the Secretary-General (U Thant) to the General Assembly through the Economic and Social Council, May 26, 1969. The Secretary-General's official, comprehensive statement on the subject.

3. THE UNITED NATIONS AND THIS BELEAGUERED EARTH, a discussion guide containing references to sources material. May be ordered from:
   American Association of University Women
   2401 Virginia Ave., NW
   Washington, D.C. 20037
   or
   United Nations Association of the U.S.A.
   833 United Nations Plaza
   New York, N.Y. 10017
   (single copy — 30¢, 100/$20, 1,000/$150)

4. THE HUMAN ENVIRONMENT: NEW CHALLENGE FOR THE U.N., an overview of current U.N. programs in the environmental field. United Nations Publication No. OPI/433, United Nations, N.Y. 10017, February 1971, 20¢.

5. ENVIRONMENT, a collection of articles and program suggestions on international aspects of the environmental crisis. United Nations Association of the U.S.A. (see Organizations), 1971, $2.50.

6. U.S. NATIONAL REPORT ON THE HUMAN ENVIRONMENT, official U.S. report to the United Nations outlining national environmental problems and topics for the Stockholm Conference. Department of State Publication 8588, June 1971. U.S. Government Printing Office, Washington, D.C. 20402, 40¢.

7. THE UNITED NATIONS: ISSUES IN UNITED STATES FOREIGN POLICY, an overview of all aspects of U.N. work with stress on issues of concern to the United States. U.S. Government Printing Office, No. 5, U.S. Department of State, 1970, $1.

8. THE UNITED NATIONS DEVELOPMENT PROGRAMME -- WHAT IT IS; WHAT IT DOES; HOW IT WORKS; WHY YOU SHOULD CARE, 1970, free, UNDP (see Organizations).

9. REPORT OF THE PRESIDENT'S COMMISSION FOR THE OBSERVANCE OF THE 25th ANNIVERSARY OF THE UNITED NATIONS, recommendations for strengthening the U.N. and U.S. participation in it. U.S. Government Printing Office, Washington, D.C. 20402, 1971, 60¢.

10. THE UNITED NATIONS IN THE 1970'S, proposals for making the U.N. more effective. United Nations Association of the U.S.A., 1971, $1.

11. VISTA, a bimonthly magazine on U.N. activities published by the United Nations Association of the U.S.A. $4 a year, $1 a copy.

12. COURIER, a magazine frequently dealing with environmental matters, published by UNESCO. Write to UNIPUB, P.O. Box 433, New York, N.Y. 10016.

Articles

1. Write to:
United Nations Conference on the Human Environment
United Nations, N.Y. 10017
for reports on the Stockholm Conference
or
Consult Readers' Guide to Periodical Literature

2. "The U.N.'s Role in the Preservation of the Environment" by Barbara Ward, VANTAGE, U.S. Catholic Conference, Division of U.N. Affairs, 323 East 47th St., New York, N.Y. 10017, 25¢.

3. "Three Reports on Global Pollution and the United Nations," SATURDAY REVIEW, Aug. 7, 1971.

4. "The Ecology Backlash" by Stanley Johnson, VISTA (see Publications), Sept.-Oct. 1970.

5. "A Message to our 3½ Billion Neighbors on Planet Earth: SOS Environment," UNESCO COURIER (See Publications) July 1971. 50¢. Describes programs to fight pollution on three continents.

6. CF LETTER -- November 1971 and April 1971. Both issues are devoted to the Stockholm Conference with thorough discussions on the need for an effective international institution on the environment. Conservation Foundation, 1717 Massachusetts Ave., NW, Washington, D.C. 20036.

Films*

1. ENVIRONMENT, 29 min., BFA Educational Media, $370, rental $25, grades 7-adult. About the degradation of our living environment and what can be done to bring about harmony with nature.

2. THE RACE IS LOSING, 30 min., Time-Life Films, $350, rental $30, grades 7-adult. Man is accelerating the deterioration of the environment with each passing year. Presents a consideration of alternative choices for doing something about it.

3. MAN'S EFFECT ON THE ENVIRONMENT, 14 min., BFA Educational Media, $175, rental $10, grades 7-12. Shows how man has altered the environment through exploitation.

4. WATER, 15 min., animated, New York University, University of California, Indiana University, Pennsylvania State University. The international crisis for lack of water. The film points out that national boundaries make the problem more complicated.

5. WHAT ARE WE DOING TO OUR WORLD?, Part I, 27 min., color, Contemporary Films/McGraw-Hill, $350, rental $18. Focuses on Lake Erie, atmosphere, nuclear power. Part II, 25 min., color $350, rental $18. Focuses on ecosystem under study in New Hampshire, the Everglades, and effects of proposed new sea-level canal.

Slide Films

1. THIS IS YOUR EARTH produced by UNESCO, 1971, 50 slides, written commentary and record, runs approximately 30 minutes. A general introduction to threats posed by man to the biosphere. $15 from UNIPUB, P.O. Box 433, New York, N.Y. 10016.

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* Addresses of film distributors are given at the end of this guide.

Organizations

1. United Nations Conference on the Human Environment
   United Nations, N.Y. 10017

2. Office of Public Information
   United Nations, N.Y. 10017
   For other information about the United Nations.

3. UNESCO
   UNESCO House
   Place de Fontenoy
   Paris 7e, France

4. World Health Organization
   20 Avenue Appia
   1211 Geneva, Switzerland

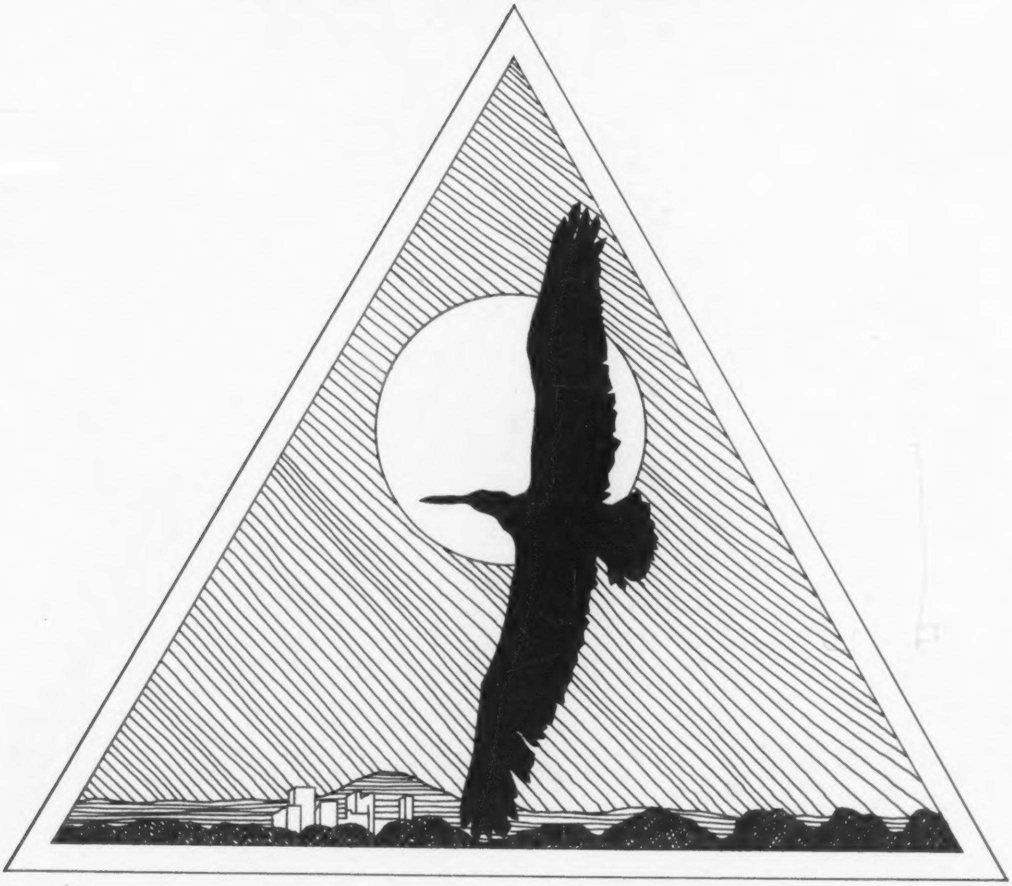
5. United Nations Development Programme
   833 U.N. Plaza
   New York, N.Y. 10017
   For information about world development and environment.

6. United Nations Association of the U.S.A.
   833 United Nations Plaza
   New York, N.Y. 10017
   For publications and film lists, other information.

7. U.S. Mission to the United Nations
   799 United Nations Plaza
   New York, N.Y. 10017
   For statements of U.S. policy and other U.S.-U.N. information.

8. UNA-USA World Affairs Book Center
   345 East 46th St.
   New York, N.Y. 10017
   Books, publications also may be ordered from U.N. Sales Section, United Nations, N.Y. 10017.

UNDER NEW MANAGEMENT



187/188

UNDER NEW MANAGEMENT

Perspective

The environmental crisis came to human attention piecemeal. Scientists discovered that with atomic bomb testing there was such an unintended "side" effect as radioactive fallout. Air pollution, perceived as a quite separate phenomenon, insinuated itself into people's eyes and lungs. Not uniformly, though, but in isolated pockets. Over New York City. Over Los Angeles, Chicago, Washington. Of course, people read of the killer smogs of London and Donora and the erosion of historic edifices in Athens, but only commercial airline pilots saw that the same coffee haze shrouded the Los Angeles region _and_ Denver _and_ St. Louis _and_ the Chicago-Detroit-Cleveland axis _and_ a broad corridor along the East Coast from Boston to Washington.

Some of these pilots also observed the brown stain in the Atlantic Ocean outside New York harbor where the city dumped its sewage sludge. People who lived and worked on the ground along the Hudson River knew how polluted that waterway was, but it took time to learn that a similar situation existed along the lower Delaware, the Mississippi, the Rhine and Seine, in the Baltic Sea and the Mediterranean, off Madagascar.

With awareness, the blights seemed to become ubiquitous. Chemical poisons. Noise. Thermal. Stench. Overloaded garbage dumps and auto graveyards, junk and litter everywhere. Denuded forests. Visual. Land abuse from strip mining and irresponsible development. Urban sprawl and urban rot and congestion and a train of social ills.

Finally, these environmental ailments coalesced into a continuous spectrum. Finally, they were conceived as symptoms of one central process:

human beings were overtaxing the environment, overwhelming its capacity to maintain equilibrium. The interchangeability became evident: dump garbage into the nearest stream, you have water pollution; throw it on land, land pollution; incinerate, it becomes air pollution.

Water pollution, waste disposal, forest destruction, and land erosion are old problems with man, but most of these symptoms certainly in their aggravated states, appeared almost simultaneously along with the tremendous technological escalations following World War II. Virtually no one had taken environmental impact into account. Behold, there was an environmental crisis!

Men reacted to these diverse dislocations with attempts to correct the observed faults, on a one to one basis. This is the way humans always have dealt with things, cause and effect -- change the cause and you change the effect. But environmental problems proved to be not so simple. No matter what remedies Holland undertook the Rhine would continue to flow a filthy river unless Germany took action. Automobiles and the generation of electric power cause most of the air pollution. People want autos and always more power. Should autos be banned from central cities? Should we return to mass transit? Can auto pollution devices answer the problem? If fewer cars are manufactured, who will answer for the loss in jobs, the effect on the economy? Will people be willing to change their life styles? Will they be forced to do so? The questions proliferate. And they illustrate the highly complex, interlocking relationships involving human activities and environmental responses.

This has led to the understanding that just as the symptoms of environmental trouble are not piecemeal, neither can durable solutions be achieved in isolation. What is called for is environmental management, a term that began to gain currency in connection with the United Nations Conference on the Human Environment. Quite possibly no one has yet fully assessed what an enormous project environmental management is...particularly when one stops to consider that environment encompasses everything that affects us: land, sea, air, water, minerals, our own species and all other life, our human culture, our individual thoughts and attitudes and behavior, and the interactions of all these constituents.

One scientist working in the field defined an environmental manager as a person who is trained to examine all the options to see that the greatest number of people get maximum benefits from the available resources. Another way of looking at it might be to say it is an effort to integrate humans with their world.

The Broadcast: UNDER NEW MANAGEMENT

The broadcast opens on the great Brazilian rain forest, the biggest unexplored land mass on earth, habitat for teeming species of plants and wildlife and some 80,000 surviving Indian natives. It is one of the world's important suppliers of oxygen, and it is regarded by Brazil as a land reservoir for its people...as a coveted area for agricultural, urban, and industrial development...as the key to new prosperity.

There cannot be great farms, ranches, cities, industrial plants while the forest remains; but if the forest is cut, the most naturally productive region on earth will be gone. If the land is denuded, so will a great oxygen factory.

The opening scenes focus on the new Trans-Amazon Highway under construction. It is a spearhead into the rain forest. It will become a spine from which the ribs of civilizations will grow. The highway is a forerunner of what is to come. Brazilians want to do no more than Americans have done to the United States — to provide adequate land for their people to occupy, to develop and become industrialized and prosperous. While there are fears that the tropical soil will not support agriculture for very long, Brazilians do not abide by what they consider an unduly pessimistic appraisal. With proper fertilizers, they maintain, the soils can be kept arable, particularly with perennial crops like coffee.

Tropical ecologist William Denevan believes that the entire Brazilian rain forest will disappear by the end of this century with difficult-to-calculate effects upon climate, land, and economy. If present slash and burn tactics followed by poor agricultural techniques continue, Denevan believes that the land will be useful only for grazing. Raising beef does not employ many people. If Brazil curbed her population explosion, Denevan says, it would not need the forest area and could avoid catastrophe.

No one knows for sure what would happen to the oxygen supply with the forest gone. If it is replaced with grasslands and other vegetation, perhaps the loss would be slight. If the area becomes a desert, the loss might be significant.

Here, then, is a modern dilemma. Is Brazil taking the route to prosperity or to catastrophe? Is the key to success, development and growth or equilibrium, which is an end to growth if not development? This issue has gained widespread attention through the publicized book, The Limits to Growth. The book presents computer studies showing that if population and industrial growth are not brought to an end, we will plunge into a global disaster. U.N. economist and Under Secretary-General Philippe de Seynes commends the study as a beginning, but believes that the real-life global situation is too complicated for such a forecast to be reliable. De Seynes believes that growth is essential for improving the lot of mankind.

What is needed is development with environmental protection -- a new discipline, a new science, environmental management!

We may appreciate what a challenge this is by reminding ourselves what environment is. A film montage suggests how comprehensive our environment is. Starting with conventional scenes of sun, sky, mountains, trees, waterways, we then see it as the habitat of wildlife and man. Rhythm and music affect and alter our environment; so do our activities, the pollution from our industries and transportation; and our culture, what we learn and what we think -- how we regard the enveloping reality around us.

Environment is so important, psychologist B. F. Skinner tells us, that really the only way we can change human behavior is through changing the human environment. So environmental management may become the crucial human enterprise as we move toward the increasingly dangerous, populated, and polluted world of the future.

A significant attempt is being made at the University of Wisconsin, at Madison, to develop the art and science of environmental management and to train environmental managers.

Before one can manage effectively, one must know exactly what is happening. Therefore, so much stress is placed on environmental monitoring. With advanced techniques in remote sensing -- through satellite photography, aerial color and infrared photography and thermal imagery -- environmental scientists can know with a high degree of accuracy what is taking place on the land and waters. Such surveillance can detect trees that have died from Dutch elm disease and map thermal discharges from paper mills, measuring the water to one-tenth of a degree.

In the Biotron, a laboratory unique in the world, micro-environments can be controlled precisely in 48 separate rooms so that scientists can study a variety of life-environment relationships under exact conditions. The exhaustive study of the behavior of the desert iguana lays the basis for learning about human behavior in a much more complex ecosystem.

A study, undertaken at the request of civic authorities, is assessing the reasons for eutrophication of Madison's Lake Wingra. This multilevel, multidiscipline investigation includes studies of aquatic life in the lake and the impact of man upon the body of water.

Finally, mineralogist D. Vincent Manson reminds us that the environment had been here for billions of years before man arrived and will remain for eons no matter what man does. The problem, really, is not one of environmental management, but of human management.

What can I do?

If environmental management means to integrate humans with their world, then it follows that the individual can take actions that will adapt himself more closely to natural ecological patterns. He can lighten his load upon the environment -- recycling, minimizing use of electrical and other power instruments, reducing dependence upon synthetic chemicals... In other words, applying the recommendations contained in the preceding sections of this guide.

That, and learning more about a subject so new that it has not yet been completely formulated or defined — a subject that is fascinating, that almost certainly will have great bearing on man's future activities, that is a gateway to future thinking.

For anyone contemplating a future career, the subject of environmental management offers unplumbed opportunities. The institutions of the State University of New York at Stony Brook and at Albany offer a variety of environmental courses. The Scientists' Institute for Public Information (30 East 68th St., New York, N.Y. 10021) published in 1970 a survey of universities offering environmental ecological studies; but the list grows, so that it would be worthwhile to inquire at the college of your choice.

For further information

Books

1. MAN IN THE LIVING ENVIRONMENT; The National Institute of Ecology, University of Wisconsin Press, Madison, 1971. Ecologists' view of problems related to environmental quality and management.
2. FUTURE ENVIRONMENTS OF NORTH AMERICA edited by F. Fraser Darling and John P. Milton; Natural History Press, Garden City, N.Y., 1966, $5.95. A basic text on the subject, loaded with information.
3. ENVIRONMENTS OF MAN edited by Jack B. Bresler; Addison-Wesley, Reading, Mass., 1968.
4. THE LIMITS TO GROWTH by Dennis Meadows, et al.; Universe Books, N.Y., 1972, $2.75.
5. WORLD DYNAMICS by Jay W. Forrester; Wright-Allen Press, Cambridge, Mass., 1971, $9.75. This supplies the statistical studies on which THE LIMITS TO GROWTH is based.
6. BEYOND FREEDOM AND DIGNITY by B. F. Skinner; Knopf, N.Y., 1971, $6.95. The crucial importance of environment to human beings.
7. FUNDAMENTALS OF ECOLOGY by Eugene Odum; W. B. Saunders, Philadelphia, $11.75. For an understanding of ecology.
8. DESIGN WITH NATURE by Ian McHarg; Doubleday, Garden City, N.Y., 1969, $5.95. Ecological land use and landscaping.
9. EARTHKEEPING by Gordon Harrison; Houghton Mifflin, Boston, 1971, $5.95. Accent on the individual's contribution.

10. POPULATION, RESOURCES, ENVIRONMENT by Paul R. Ehrlich and Anne H. Ehrlich; W. H. Freeman, San Francisco, 1970, $8.95.

11. MANAGING THE ENVIRONMENT: International Economic Cooperation for Pollution Control, edited by Allen Kneese, Sidney Rolfe, Joseph Harned; Praeger, N.Y., 1971, $15. Findings of a conference on "Goals and Strategy for Environmental Quality Improvement in the 1970's."

12. THE ECOSYSTEM CONCEPT IN NATURAL RESOURCE MANAGEMENT, edited by George M. Van Dyne; Academic Press, N.Y., 1969, $16.50. Highly technical and leaving man out of the picture.

13. TECHNOLOGY AND GROWTH by E. J. Mishan; Praeger, N.Y., 1970, $7.95. Views of an unorthodox economist who sees the penalties of growth.

14. OUR PLUNDERED PLANET by Fairfield Osborn; Little, Brown, Boston, 1948. A record of the environmental toll exacted by man.

15. THE QUIET CRISIS by Stewart Udall; Avon, N.Y., 1963, 95¢. A review of the conservation movement and opposing forces.

16. THE PACIFIC SALMON FISHERIES: A Study of Irrational Conservation by James Crutchfield and Giulio Pontecorvo. Published for Resources for the Future by the John Hopkins Press, Baltimore, 1969, $6. Economists on resource management.

17. THE LAST LANDSCAPE by William H. Whyte; Doubleday, Garden City, N.Y., 1968, $6.95.

18. THE AFFLUENT SOCIETY by John Kenneth Galbraith; Mentor, N.Y., 95¢. On continuous growth as an ideal.

19. THE LIFE OF THE JUNGLE by Paul W. Richards; McGraw-Hill, N.Y., 1970, $4.95. Ecology of rain forests with a discussion of "slash and burn" agriculture.

20. THE LIFE OF THE AFRICAN PLAINS by Lester Brown; McGraw-Hill, N.Y., 1972, $4.95. Primitive human and natural environments.

Articles

1. "Ecolibrium" by Athelstan Spilhaus, SCIENCE, 175, February 18, 1972. On the need for long-term planning.

2. "The Strategy of Ecosystem Development" by Eugene P. Odum, SCIENCE, 164, April 18, 1969. An understanding of ecological succession, the author says, provides a basis for resolving man's conflict with nature.

3. "The Human Environment in Technological Societies" by Rene Dubos, THE ROCKEFELLER UNIVERSITY REVIEW, July-August 1968.

4. "Resources, Population, and Quality of Life" by Preston Cloud, meeting of the American Society for the Advancement of Science, Boston, December 29, 1969.

5. "Needed: Effective Management of Our Priceless Shorelines and Estuaries," CF LETTER, May 1970. Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C.

6. "Environmental Quality: When Does Growth Become Too Expensive?" by S. Fred Singer. Paper presented to American Association for the Advancement of Science Meeting, Boston, December 1969. It becomes too expensive, the author says, when the cost of maintaining environmental quality becomes unacceptable to society.

Films*

1. A SEARCH FOR ECOLOGICAL BALANCE, 38 min., Film Images, $360, rental $25, grades 7-adult. Ecologist Eugene Odum, with a call for a sound master plan for the total environment.

2. MULTIPLY AND SUBDUE THE EARTH, 67 min., Indiana University, color, $450, rental $18.50, b&w $270, rental $13.50, grades 10-college. Ian McHarg points out that man needs to know how much he can intervene and still remain in harmony with the land, must know land's carrying capacity when undertaking development.

3. POLLUTION IS A MATTER OF CHOICE, 54 min., NBC, Pyramid, University of Michigan. An NBC News special presented April 7, 1970, it focuses on the predicament of wanting what technology creates, yet being destroyed by its wastes.

4. THE TRAGEDY OF THE COMMONS, 23 min., King Screen Productions, $295, rental $35, grades 7-adult. The story of what happens when a common resource is overused.

5. THE RACE IS LOSING, 30 min., Time-Life Films, $350, rental $30, grades 7-adult. On correct uses of technology and alternative choices for a healthier environment.

6. MEN AT BAY, 26 min., color, King Screen Productions, University of Michigan. A discussion of the threatened destruction of San Francisco Bay, and proposed solutions.

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* Addresses of film distributors are given at the end of this guide.

7. ENVIRONMENT, 29 min., BFA Educational Media, $370, rental $25, grades 7-adult. Film points out that causes of environmental deterioration are complex and related to advantages of industrialized society, raises question of what balance can be achieved between technology and quality of environment.

8. PROBLEMS OF CONSERVATION: OUR NATURAL RESOURCES, 11 min., Encyclopedia Britannica Educational Corporation, $135, rental $8, grades 7-12. An overview of growing crisis in natural resources.

9. PROBLEMS OF CONSERVATION: MINERALS, 16 min., Encyclopedia Britannica Educational Corporation, color $200, b&w $102.50. Designed to stimulate student discussion on effects of mineral depletion.

10. GRASSLAND ECOLOGY — HABITATS AND CHANGE, 13 min., Centron Educational Films, $175, rental $17.50, grades 4-12. Emphasizes man's responsibility and stewardship for remaining natural environments.

11. LIFE IN A TROPICAL FOREST, 30 min., Time-Life Films, $300, rental $30, grades 4-adult. The story of the forest ecosystem.

12. ECOLOGY — OLYMPIC RAIN FOREST, 20 min., International Film Bureau, $250, rental $12.50, grades 7-adult. Explains ecology of a rain forest.

13. OUR VANISHING WILDERNESS -- THE PRAIRIE KILLERS, 30 min., Indiana University, $315, rental $11.50. Shows poisoning of prairie dogs and coyotes and how chain of life becomes a chain of death.

Organizations

1. Conference on the Human Environment
   United Nations, N.Y. 10017

2. Man and the Biosphere Program
   UNESCO
   Place de Fontenoy
   Paris 7e, France

3. Department of Environmental Conservation
   50 Wolf Rd.
   Albany, N.Y. 12201

4. Institute for Environmental Studies
   University of Wisconsin
   1225 West Dayton St.
   Madison, Wis. 53706

5. The Ecological Society of America
Frank McCormick, Secretary
Department of Botany
University of North Carolina
Chapel Hill, N.C. 27514

6. The World Environment and Resources Council, holding its organizational meeting in The Hague, Netherlands, in June 1972, is designed to be a clearinghouse for professional societies, sorting recommendations on environmental priorities and research.
Contact: Dr. Enrico P. Mercanti
The World Environment and Resources Council
12415 Shelter Lane
Bowie, Md. 20715

Film Distributors

1. Arthur Barr Productions, P.O. Box 7-C, Pasadena, Calif. 91104
2. Association Films, 600 Grand Ave., Ridgefield, N.J. 07657
3. BFA Educational Media or Bailey-Film Associates, 2211 Michigan Ave., Santa Monica, Calif. 90404
4. Capital Film Laboratories, 470 East St. SW, Washington, D.C. 20024
5. Carousel Films, 1501 Broadway, New York, N.Y. 10036
6. Centron Educational Films, 1621 West 9th St., Lawrence, Kans. 66044
7. Contemporary Films/McGraw-Hill, 327 West 41st St., New York, N.Y. 10036
8. Coronet Films, 65 East South Water St., Chicago, Ill. 60601
9. Encyclopedia Britannica Educational Corporation, 425 North Michigan Ave., Chicago, Ill. 60611
10. Film Images, 17 West 60th St., New York, N.Y. 10023
11. Florida State University, Educational Media Center, Tallahassee, Fla. 32306
12. Fordham Publishing Company, 2377 Hoffman St., Bronx, N.Y. 10458
13. Holt, Rinehart & Winston, 383 Madison Ave., New York, N.Y. 10017
14. Indiana University, Audio-Visual Center, Bloomington, Ind. 47401
15. International Film Bureau, 332 South Michigan Ave., Chicago, Ill. 60604
16. Kent State University, Audio-Visual Services, Kent, Ohio 44240
17. King Screen Productions, 320 Aurora Ave. North, Seattle, Wash. 98109
18. Learning Corporation of America, 711 Fifth Ave., New York, N.Y. 10022
19. Mass Media Ministries, 2116 North Charles St., Baltimore, Md. 21218
20. Michigan State University, Instructional Media Center, East Lansing, Mich. 48823
21. Modern Talking Picture Service, 1212 Avenue of the Americas, New York, N.Y. 10036
22. National Broadcasting Company, 30 Rockefeller Plaza, New York, N.Y. 10020

23. New York University, Film Library, 26 Washington Plaza, New York, N.Y. 10003

24. Planned Parenthood/World Population, 810 Seventh Ave., New York, N.Y. 10019

25. Pennsylvania State University, Audio-Visual Services, 6 Willard Bldg., University Park, Pa. 16802

26. Pyramid Films, Box 1048, Santa Monica, Calif. 90406

27. Roa's Films, 1696 North Astor St., Milwaukee, Wis. 53202

28. Scott Foresman and Co., Film Distribution Center, 305 East 45th St., New York, N.Y. 10017

29. State University of New York, Film Library, College of Forestry, Syracuse, N.Y. 13210

30. Sterling Educational Films, 241 East 34th St., New York, N.Y. 10016

31. Time-Life Films, 43 West 16th St., New York, N.Y. 10011

32. University of Arizona, Bureau of Audio-Visual Services, Tucson, Ariz. 85721

33. University of California, Extension Media Center, Berkeley, Calif. 94720

34. University of Michigan, A-V Education Center, 416 Fourth St., Ann Arbor, Mich. 48103

35. University of Minnesota, Department of A-V Extension, 2037 University Ave. SE, Minneapolis, Minn. 55455

36. University of Southern California, Film Distribution Section, University Pl., Los Angeles, Calif. 90007